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Bibliography on Auroral Physics

Vol. 5 March 1954 No. 3

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

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B. Bibliographic references to other items of interest to the profession.

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 5 MARCH, 1954 No. 3

SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Auroral Physics

(For complete table of contents see back cover)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, etc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of important references on a special subject. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues of Vol. 1, **1950** were:

1) **Atmospheric Pollution,** 2) **Aerobiology,** 3) **Cloud Physics,** 4) **Hail,** 5) **Tornadoes,** 6) **Volcanic Dust,** 7) **Climatic Changes,** 8) **Thunderstorms,** 9) **Icing,** 10) **Acoustical Propagation** and 11) **Evaporation.**

Those published in Vol. II, **1951** were:

1) **Extended Forecasting,** 2) **Long Range Forecasting,** 3) **Soil Temperature,** 4) **Constants, Tables, etc.,** 5) **Climate of Near East,** 6) **Climate of Middle East,** 7) **Special Winds,** 8) **Radar Storm Detection,** 9) **Condensation Trails,** 10) **Climate of Northeast Africa** and 11) **Mountain Meteorology.**

Other bibliographies previously published were:

No.	Mo.	Vol. III, 1952	Vol. IV, 1953
1.	Jan.	**Climate—Northwest Africa**	**Turbulence Theory**
2.	Feb.	**Carbon Dioxide**	**Turbulent Diffusion and Exchange**
3.	March	**Climate—Argentina, etc.**	**Frost and Frost Forecasting**
4.	April	**Dew**	**Climate of Australia and New Zealand**
5.	May	**Objective Forecasting**	**High Level Winds (500–100 mb)**
6.	June	**Stratus Forecasting**	**High Level Winds (above 100 mb)**
7.	July	**Urban Climatology**	**Jet Stream**
8.	Aug.	**Climate—Central Africa**	**Radiation Bioclimatology**
9.	Sept.	**Visibility**	**Climatology of the Pacific**
10.	Oct.	**Glaze and Rime**	**Auroras**
11.	Nov.	**Free Air Turbulence**	**Sferics**

Bibliographies published this year are:

1. **General Oceanographic Meteorology,** Vol. V, No. 1, Jan. 1954
2. **Climate of Southeast Asia and Netherlands Indies,** Vol. V, No. 2, Feb. 1954
3. **Physics of Auroras,** Vol. 5, No. 3, March 1954

Forthcoming bibliographies will be:

4. **Tropopause,** Vol. 5, No. 4, April 1954
5. **Balloons,** Vol. 5, No. 5, May 1954
6. **Numerical Forecasting,** Vol. 5, No. 6, June 1954

Other bibliographies in preparation are:

Actinometers
Arctic Meteorology
Climate of the Arctic
Engineering Meteorology
Fog Forecasting
Machine Methods in Meteorology
Microwave Propagation
Night Airglow
Ozone
Radiation Data
Snow Cover
Synoptic Aerology
Tropical Cyclones
Wind Waves and Currents

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society) Library, Milton, Mass.
NN:	New York Public Library, New York, N. Y.
NNA:	American Geographical Society Library, New York, N. Y.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
!	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

WORKS OF SPECIAL INTEREST

5.3–1 551.583.2:551.311.12

Ahlmann, Hans W., **Glacier variations and climatic fluctuations.** N. Y., American Geographical Society, **1953.** 51 p. 11 figs., 4 plates, 2 tables, refs. *Bowman Memorial Lectures*, Series three. **DLC**—Recent glaciological investigations in Queen Maud Land, Norway, and Spitzbergen are described. Glacial variation depends on relation between precipitation and ablation, the latter depending on convection, condensation and radiation, which vary in importance according to locality. Reaction to climatic changes and time lag are discussed; regime depends essentially on spring and summer temperatures. Glacier advances and retreats since 1700 in various parts of the world are illustrated. In spite of local variations there has been a general retreat since 1850 or 1900, corresponding with rise of seasonal temperatures. The cause is in some way connected with changes of atmospheric circulation. Concomitant changes of drift ice, fauna and flora are described. Finally, the present change is placed in relation to the sequence since 8,000 B.C. The text of the lecture is followed by extensive references and notes. (For brief summary *see item* 4.2–243, Feb. 1953, *MAB*). *Subject Headings:* **1. Historical climates 2. Glaciers 3. Climatic changes. I. American Geographical Society. Bowmann Memorial Lectures.**—*C.E.P.B.*

5.3–2 550.38

Cougnard, Jerome, **Mes interprétations en astronomie, électromagnétisme terrestre et radioactivité.** [My interpretations of astronomy, terrestrial electromagnetism and radioactivity.] Toulouse, Editions Toulousaines de l'Ingénieur, **1949.** 293 p. 126 figs., eqs. **DLC.** English trans. by Jean d'Ablon. Loos-Lez-Lille, France, Pub. by the author, March **1952.** 297 p. 126 figs. (1 fold.), eqs. **DLC**—A novel but intriguing explanation of the order of the entire universe, from atomic or electronic motion to those of the planets, stars and galaxies, on the basis of the properties of magnetic fields. The author is an engineer who has devoted dozens of pages of mathematical calculations, precise diagrams, etc. to this task. Explanations are given, based on the above theory, of instances of ball lightning. The cause of sunspots and their effect on the earth's climate is "explained" in Chap. III. The book consists of a strange mixture of fact, speculation, and pure nonsense. The desert locusts of North Africa are said to be infallible predictors of drought conditions, due to some uncanny ability of the locusts to see conditions on the sun's surface. In a similar vein the irregular recession of certain glaciers in Switzerland is attributed to the stepwise warming of the earth as planets are ejected from the sun. *Subject Headings:* **1. Magnetic fields 2. Cosmography 3. Terrestrial magnetism 4. Translations. I. d'Ablon, Jean** (*trans.*).—*M.R.*

5.3–3 551.524.36:551.590.22

Henstock, Herbert (*Glengariff, Cerwys, N. Wales*), **Minimum night temperatures at or near full moon,** [**Part I**] and **Part II.** With Comments and communications by Robert L. Edwards, E. J. Newcomer, Louis C. Erickson, R. T. Wedding, G. B. Oakland, Richmond W. Longley, and Eberhard W. Wahl. *Science*, Wash., D. C., 116(3010):257–260, Sept. 5, **1952** and 117(3038):302–310, March 20, **1953.** figs., tables, refs. **DWB**—The first article by Henstock, which evoked more criticism than any meteorological paper published in recent years, is an extension of previous work by the author "On the relation of minimum night temperatures in North Wales to the full moon" to cover data for 13 stations in various parts of the world (India, Transvaal, Australia, Canada, California and Oregon). Significant drops are said to occur more often than normal expectancy "on or about" the date of the full

moon, which is loosely applied to the *week* of the full moon, although the test of significance is evidently applied to the normal expectancy for any given *day* during the period. The fact that falls in temperature occur more often in winter than in summer is due to the greater variability of temperature in winter. No attempt is made to show how drops in temperature of a specified amount are distributed throughout the lunar calendar—a technique which is over 200 years old. In Pt. II, the author goes on to give a physical "explanation" of the phenomenon which he now assumes is a proven fact—namely, that the gravitational pull of the moon expands the atmosphere adiabatically, resulting in a cooling which should be accompanied by a pressure fall. Data for Wellington, N. Z., and Caerwys, Wales, for 1949 are presented to show that a pressure fall usually does occur "about" the time of the temperature fall, or of the full moon. However, the correlation is as poorly marked as is the normal occurrence of the events themselves—the drop in pressure ranging from 6 days before to 1 day after the drop in temperatures. In the "Comments" EDWARDS shows average variations of mean temperature from normal for each day of the lunar month in summer and in winter and combined. The curves show what appears to be significant departures for several days during the 3rd quarter (19–25 days after new moon) in winter and a reverse tendency during the same phase in summer—the two effects nearly cancelling out in the annual average. NEWCOMER analyzed Yakima, Wash., data for 15 years and found the evident tendency too erratic from year to year to be of any use in spring frost forecasting in that region. ERICKSON and WEDDING, using a precise definition of a temperature drop and more rigid statistical methods to test 10 years of minimum temperature data at Riverside, Calif., found the mean greatest fall during 124 lunar cycles to be 10.40, 9.31, 9.86 and 10.11°F in the 4 phases of the lunar month, giving a *t*-test value of 1.03 (required value for significance at 5% level = 2.62) or much too small a value to support the HENSTOCK theory. OAKLAND at Ottawa, Canada, using data for Ottawa, Regina and Edmonton for 1950–1951 tested the falls and rises on the exact day of the full moon against those for the 13 days preceding and following respectively and by season, and found no difference between one quarter and another, either for falls, rises or greatest consecutive fall in temperature within 48 hours of the moon's phases. LONGLEY (Toronto) criticizes the loose definition of period and amount of fall and using a more rigid definition for the Canadian stations than HENSTOCK used (Victoria, Aklavik, Banff) gets less significant results compared to HENSTOCK's "average normal temperature fall." Testing 165 cases, the drop in temperature per day near the full moon was less than the average daily change in temperature in 84 cases and greater in 81 cases. Finally, E. W. WAHL at Cambridge, Mass., questions validity of using only 5 years of data at one station and only one year at others. He found no significant lunar relationship when 20 years of Boston data were analyzed. Suggests using much longer records and removing possible solar cycles. *Subject Headings:* **1. Lunar influences 2. Minimum temperature forecasting 3. Statistical techniques. I. Edwards, Robert L. II. Newcomer, E. J. III. Erickson, Louis C. IV. Wedding, R. T. V. Oakland, G. B. VI. Wahl, Eberhard W. VII. Longley, Richmond W.**—*M. R.*

5.3–4 551.556:551.465

*Keulegan, Garbis H., **Hydrodynamic effects of gales on Lake Erie.** *U. S. National Bureau of Standards, Journal of Research*, 50(2):99–109, Feb. **1953.** 17 figs., tables, 9 refs., eqs. **DWB**—The coefficients of wind stress and the sea roughness are derived from records of water levels and wind intensities relating to gales passing over Lake Erie during the past fifty years. The reduction of wind velocity measured at various elevations in four cities on the lake shore to a single "effective wind velocity" over the lake is explained. A theoretical determination of the wind tides agrees well with the observations. The coefficient of wind stress derived from the observations, is nearly the same as that obtained by NEUMANN from observations in the Gulf of Bothnia. Both the coefficient of wind stress and the sea roughness are found to decrease with increasing wind velocities. *Subject Headings:* **1. Wind stress 2. Sea surface roughness 3. Lake Erie.**—*Author's abstract.*

5.3–5 551.521.63(02)

†*Koller, Lewis R. (*Res. Assoc., Gen. Electric Res. Lab.*), **Ultraviolet radiation.** N. Y., John Wiley, **1952.** 270 p. numerous figs. and tables, refs. **DLC**—A general textbook on short wave radiation, intended for physicists, biologists, chemists, engineers and laymen.

Short wave radiation is defined as electro-magnetic radiation between 40 and 4000 Å, although the eye *can* detect radiation as short as 3760 Å at 1/100,000 the sensitivity of the maximum value for the eye. Young people can see as far as 3130 Å. Near UV comprises 4000 to 3000 Å, far UV 3000 to 2000, and extreme UV 2000 to 40 Å. Chap. IV takes up the various aspects of solar radiation: the concept of air mass, solar altitude, effect of absorption in various spectral regions, transmission constants, ozone, sky radiation, daily and seasonal variations, solar energy distribution by wave length, geographical variations, effects of cloud base altitude angle of incidence and finally, applications to living conditions, erythemic effects, etc. *Subject Headings:* **1. Ultraviolet radiation 2. Textbooks.**—*M.R.*

5.3–6 551.508.77:016

†Kurtyka, J. C., **Methods of measuring precipitation for use with the automatic weather station.** *Illinois. State Water Survey, Report of Investigation*, No. 20, **1953.** 178 p. 193 figs., 11 tables, 1079 refs., many with annotations. Also issued as Illinois State Water Survey. Meteorologic Laboratory, Contract DA-36-039 SC-15484, Project DA-36-02-042, Project SC 794C-0, Precipitation Measurements Study, Annual Report, Feb. 15, 1952–Feb. 15, 1953; Fourth Quarterly Progress Report, Feb. 1953. **MH-BH**—This report presents an amazingly thorough review of the history of rain measurements, type, material, form, height, diameter, exposure, etc. of rain and snow gages, recording gages, vectopluviographs, totalizers, shielded gages, rate of rainfall recorders, drop size and water content measurements, etc. of every conceivable pattern from the middle of the 19th century to date and from every country. Nearly 200 photographs or drawings illustrate many of these gages or devices. The annotated bibliography contains 1079 references carefully checked and arranged according to MAB style. *Subject Headings:* **1. Precipitation gages 2. Rain and snow gage bibliographies 3. History of meteorology. I. Contract DA-36-039 SC-15488 II. Illinois. State Water Survey. Meteorological Laboratory.**—*M.R.*

5.3–7 551.585.1:551.556:551.465(47)

Liashnitskiĭ, Valerian Evgen'evich, **Morskie porty.** [Sea ports.] Moscow, Izdat. "Morskoĭ Transport," **1948.** 561 p. 494 figs., 86 refs. **DLC**—On p. 55–57 there is a discussion of meteorological and climatic factors affecting coast lines and installations. These include winds, air and water temperatures (freezing), and fog. Uses of frequencies of occurrence are emphasized, for instance, frequency of winds of various forces and from various quadrants (wind roses) instead of prevailing or average values. Examples of wind roses showing construction and application to a point on the Caspian Sea are given. Observations of freezing and opening of harbors and observations of water temperature are also discussed. In the previous chapter the effect of wind in producing waves, high tides and the effects of these forces on harbors is treated in greater detail. *Subject Headings:* **1. Marine meteorology 2. Wind effects 3. Wind roses 4. Coastal climates 5. U.S.S.R.**—*M.R.*

5.3–8 551.5(02) 551.501.42

†*Linke, Franz, **Linke's Meteorologisches Taschenbuch,** v. 2. New ed. Ed. by Franz Baur and others. Leipzig, Geest & Portig, **1953.** 724 p. 194 tables, 9 graphs (fold.), 71 figs., refs. throughout. **DLC**—This second volume of the new edition of LINKE's famous "Taschenbuch" contains the greatest amount of mathematical and physical tables, equations, constants and data ever assembled in such a convenient edition. The material has been greatly amplified and considerably revised since the previous (4th) edition, and contains entirely new chapters or sections. Graphical material is scattered throughout the volume and an extensive subject index appended. Separate chapters were prepared by the respective authors as follows: Chap. I. An extensive list of mathematical and physical symbols used in meteorology. Chap. II. By BAUR and OLSCHEWSKY gives formulas and tables used in meteorology subdivided according to: A. Algebra, B. Calculus, C. Variation calculation, D. Integral equations (LUDWIG SANER), E. Geometry, F. Vector and tensor analysis, G. Errors and smoothing, H. Interpolation, J. Probability and statistical calculations. Chap. III. by Raethjen gives equations used in dynamic meteorology: A. Gas laws, B. Thermodynamics, C. Statics, D. Dynamics of fields of motion, E. Dynamics of eddy motion, F. Continuity and vertical motion and G. Austausch. Chap. IV. by ZIMMERSCHIED is concerned with methods of working up

aerological observations (airplane, radiosonde, radiation, wind, isentropic analysis, thermodynamic charts, cross sections and rocket flights). Chap. V. by LANDSBERG gives 6 climatic cross sections of the free atmosphere (0 to 20 km height) for Jan. and July along 3 meridians (120° and 75° W, and 15°E) from 10° to 70°N lat. Chap. VI. comprises half of the volume (p. 381–712), and consists of A. astronomic and geodetic and B. physical tables (BAUER), C. tables of pressure and density and other static parameters (MÖLLER), D. tables on the thermodynamics, humidity, cloud physics, E. on the Dynamics of the atmosphere and F. on Radiation and Optics by MÖLLER, G. on Atmospheric electricity, H. on Ionospheric research (RAWER) J. a series of long period records of weather (cyclonic and anticyclonic periods), temperature, precipitation, ozone, sunspot numbers, etc. BAUR, BARTELS and GOTY K. mathematical tables and L. conversion tables. For 1st ed. of the "Taschenbuch" *see item* 2D–11, April 1951, and for 1st v. of 2nd new ed. *see* 4.9–12, Sept. 1953, *MAB*. *Subject Headings:* **1. Conversion tables 2. Mathematical aids 3. Physical tables 4. Equations 5. Statistical aids. I. Israël, Hans II. Landsberg, Helmut III. Möller, Fritz IV. Olschevsky, Therese V. Raethjen, Paul VI. Rawer, Karl VII. Sauer, Ludwig VIII. Zimmerschied, Wilhelm IX. Baur, Franz,** (*ed.*).—*M.R.*

5.3–9 551.509.33

†Namias, Jerome, **Thirty-day forecasting: a review of a ten-year experiment.** With a foreword by Hurd C. Willett. *Meteorological Monographs*, Boston, Mass. 2(6), July **1953.** 83 p. 80 figs., 4 tables, bibliog. p. 79–81. eqs. **DWB**—Sample monthly outlook (April 1, 1953) in pocket. This important monograph consolidates in its several chapters the results of 15 years of research and development of a method (or rather a complex of methods) of extrapolation forecasting for periods from 5 to 30 days. The techniques and aids described and illustrated here combine a variety of statistical, dynamic and synoptic theoretical and empirical studies. The project began in 1935 under the Bankhead-Jones act with a survey of existing methods of long-range forecasting, and the next year with an attempt at making 10-day forecasts for many cities. Verification showed no skill but a great interest was aroused. In 1942 the author began systematic studies to try and extend the range of forecasting which would show some improvement over climatology. As a background for 30-day forecasts, the climatic normals and frequency distributions of parameters which are to be forecast, or which serve as intermediate steps in preparing the forecasts, were thoroughly compiled in statistical and graphical form. Numerous examples of surface and 700 mb charts and related data, are included in Chap. II. Studies of the relation of the mean circulation patterns to weather and storm tracks, together with sample charts, showing correlations, paths, etc. comprise Chap. III. The physical characteristics of the monthly mean circulation on a hemispheric scale and anomalies in the patterns are taken up in Chap. IV, while Chap. V goes into the evolution of this monthly mean circulation, with many examples from the actual forecast experience. Chap. VI gives some insight into the various methods (kinematic, dynamical) and their statistical basis, for forecasting motion and development of planetary waves; and index cycles. Chap. VII presents some of the statistical aids such as lag-correlation charts for temperature and precipitation anomalies and classification of temperature patterns and correlations between temperature and precipitation. Chap. VIII discusses evaluation or verification of records. Results show some skill but room for a lot of improvement. *Subject Headings:* **1. Extended forecasting 2. Long range forecasting. I. Willett, Hurd C.**—*M.R.*

5.3–10 551.515.11:551.513.1(02)

§†Raethjen, Paul, **Dynamik der Zyklonen.** [Cyclone dynamics.] *Probleme der kosmischen Physik*, v. 27, **1953.** 384 p. 92 figs., 3 tables, bibliog. p. 339–373, 357 eqs. Price: DM 35. **DLC**—A critical evaluation of cyclone theories and models of cyclogenesis developed during the past century in Europe and America, is presented here from the point of view of modern observations and theoretical concepts, combined with the extensive results of the author's own research in this field. The reader will appreciate the clear and comprehensive presentation of the leading principles in the dynamics of cyclones and the extensive bibliography (which provides a guide to other points of view). The first half of the book gives the physical explanation of the processes involved, emphasizing that the observed processes must

be used as the basis for construction of simple theoretical models, while mathematical simplifications, made *a priori*, can give wrong results. Among the numerous aspects discussed in this part we find, for example, the formation of vortexes, frontal waves, two-layer pressure waves, tropopause waves, frontal zones, action centers and central cyclones, four-cell pressure fields, mass exchange in frontal cyclones, jet stream, meander and cutoff, planetary and monsoonal general circulation and their relation to the formation of cyclones, tropopause circulation, principal conditions for cyclogenesis (wind vortex, cyclonic shear, thermic and dynamic pressure fields), cyclogenetic models (injection from the stratosphere, convective cyclone), role of gliding austausch, etc. The second part can be considered as a handbook of mathematical approaches to the problem of cyclones, presenting the most modern results with a judicious selection of earlier theories insofar as they agree with observations. In particular, information can be found on vorticity and its individual changes, the effect of horizontal divergence and vertical movements, statics and kinematics of pressure field changes, including wedge shape injections (Keileinschub), two-dimensional austausch of momentum (effect of isotropic and monotropic exchange), tropopause deformations, long waves, delta-cyclogenesis, small scale vertical convection, convective cyclones, typhoons, monsoonal lows, etc. The newly proposed theory of adaptation and compensation is especially interesting. RAETHJEN assumes a disturbance in the wind field, superimposed as a vortex on the geostrophic field and analyzes the resulting superimposed pressure field. The characteristic duration of the resulting oscillation shows that the whole process can be assumed as aperiodically damped Two models are discussed, one as an all-layer vortex, the other as a disturbance in one layer only. A new derivation of the law of constant absolute vorticity is given; it shows that for large vortexes an additional factor has to be considered, the so called "adaptation characteristic." Cyclones, according to RAETHJEN, are of dual origin. Either they are marginal effects of the planetary polar cyclones, with maximum vorticity in the tropopause layer, or their formation is caused by the heated earth surface, especially by the subsequently liberated latent heat of evaporation. Both effects can be found in frontal zones. The book is well suited to fill the gap between the practicing meteorologist by facilitating his understanding of modern theories, and the theoretician by showing him what actually is going on in the atmosphere. *Subject Headings:* **1. Cyclone dynamics 2. General circulation 3. Textbooks.**—*A.A.*

5.3–11 551.524.4:551.554:551.571.4 551.511:551.551

Rider, N. E., **The eddy diffusion of momentum, water vapour and heat near the ground.** *Great Britain. Meteorological Research Committee, M.R.P.*, 809, May 12, **1953.** 20 p. 9 figs., 5 tables, 11 refs. eq. Mimeo. **GB-MO**—Vertical profiles of wind, temperature and humidity 15–200 ft above short grass at Cardington, with rate of evaporation, aerodynamic surface drag and components of heat balance, are tabulated. Eddy diffusivities of momentum, water vapor and heat always, and humidity generally, had the same form. In adiabatic conditions (Ri small) the established laboratory law for surface drag holds with $k = 0.41$ and $Z_0 = 0.3$ cm. In unstable conditions E. L. DEACON's generalized wind profile law holds; in stable conditions the equations of C. G. ROSSBY and R. B. MONTGOMERY, or of B. HOLZMAN hold. It is found that diffusivities for momentum and vapor are given by identical parameters and are equal in all conditions, but that of heat is sometimes larger. *Subject Headings:* **1. Eddy diffusion 2. Humidity lapse rate 3. Vertical temperature gradient 4. Wind profiles.**—*C.E.P.B.*

5.3–12 529:634.94

†*Schulman, Edmund, **Tree-rings and climatic changes in western North America.** Arizona. University, Contract NR089-020, Final Report, June 20, **1953.** 138 p. 28 figs. and 80 tables (photostat), refs. p. 137–138. Mimeo. **DWB**—Charts are presented *in extenso* for results of 314,000 tree rings measured in most of the major drainage basins of the western U.S.A., S.W. Canada and Alaska. Over 50% are for sites in the Colorado River Basin. Intensive work under contract for 3 years (1949–52) plus work by author since 1939 and by DOUGLASS and others even before 1939 are included. Sites are described in detail and species of trees, method of measurement (to .01 mm), location of sample sites (tabulated), cross indexing, remarks on extremely long records (old trees) and dates of extremely large and small

rings are included in this voluminous report (which contains a number of previously reported tables and charts). The tree ring width is taken to be an indicator of rainfall (or drought) in the arid SW and of temperature in Alaska. Records date back 2009 years in Colorado, 1494 years in the Snake River area and 975 in Missouri. The author points to evidence of a 200 year wave in rainfall in Colorado Basin. At Banff 1897–1904 showed higher rainfall and growth than at any time in the past 4 centuries. At the same time phenomenal drought occurred in Colorado Basin and S. California. The most extensive drought was 1573–1593 (from S.W. Montana to S. California). Correlations between SW Canada and California or Colorado Basin, which appear to be strongly negative for centuries, often break down completely and become positive for equally long periods. Comparison of the 3200 years series of *Sequoia* from California with the above measurements shows the former to be of little use during the 1300 years B.C. owing to poor techniques. *Subject Headings:* **1. Dendrochronology 2. Tree ring data 3. Western North America.**—*M.R.*

5.3–13 551.573:551.481.1(08)

*†U. S. Navy Electronics Laboratory, San Diego, Calif., **Water-loss investigations, Vol. 1, Lake Hefner studies technical report.** *U. S. Geological Survey, Circular* 229, **1952.** 153 p. 29 tables, 98 figs., refs., 108 eqs. Appendix: **Symbols and dimensions.** *U. S. Navy Electronics Laboratory, San Diego, Calif., NEL Report,* 327, **1952. DWB**—Comprehensive attack on the problem of evaporation, sponsored by the Navy, the Geological Survey and the Weather Bureau of the United States. Goal of the study: the determination of evaporation by means of climatological data using mass-transfer and energy-budget theories. Tests made using evaporation values computed from the water budget of the lake. Report contains the following papers: HARTECK, G. EARL, Jr., "General description of Lake Hefner," gives also climatic description, using data for Oklahoma City; DENNIS, P. E., "Geology and ground water hydrology of the Lake Hefner Area"; HARTECK, G. EARL, JR. and KERMON, FRANK W., "The water-budget control," computation of actual evaporation based on careful measurements of rainfall, inflow, outflow and change in reservoir contents, considering also evapotranspiration losses from the shore and thermal expansion of lake; ANDERSON, LLOYD Y., "Instrumentation for mass transfer and energy-budget studies," recording measurements of air temperature, humidity and wind speed at 2, 4, 8 and 16 m. above the lake surface, water surface temperature, wind direction and rainfall, as well as measurements of solar and terrestrial radiation and of solar radiation reflected from the water surface; MARCIANO, Y. Y. and HARTECK, C. EARL, JR., "Mass transfer studies," valuable concise review on turbulent transfer of water vapor. A series of theoretical equations was tested. The best was SVERDRUP's formula (1937) and almost as good was SUTTON's equation. THORNTHWAITE-HOLZMAN's equation does not give good results, without proper instrumentation. All other tested evaporation equations were found to be unsatisfactory. For practical use the equation $E = 6.25 \cdot 10^{-4}\ U_8(e_0 - e_8)$ was used, (usual symbols, index $_8$ for 8 m height). ERNEST, R., "Energy-budget studies," one of the best papers ever published in this field. Indirect methods of evaluating solar radiation were tested against values measured at Lake Hefner and found to be inadequate for evaporation computations. Very detailed study devoted to theoretical and observed reflectivity (R_t) of short waves from the water surface. Empirical relationship proposed: $R_t = aS_A{}^b$; S_A = altitude of sun; $a = 1.18$, $b = -0.77$ for clear sky, variable for cloudy sky. Other studies and tests were made for effective back radiation (clear and cloudy sky), radiation for the body of water, reflected long wave radiation, advected energy, the Bowen ratio, convective heat, evaporation energy, etc. HARTECK, G. EARL, Jr., "Cummings radiation integrator." The late N. W. Cummings suggested to use a water pan, thermally insulated by rock wool and perlite concrete to measure the integrated energy balance. Test results satisfactory. KOHLER, MAX A., "Lake and pan evaporation," presents a comprehensive literature summary of monthly and annual pan-to-lake reduction coefficients. Theoretical water-temperature and energy-balance approach for this coefficient outlined and numerous results, obtained during the Lake Hefner experiment, given. *Subject Headings:* **1. Evaporation 2. Turbulent transfer of moisture 3. Heat balance of lakes 4. Evaporation pans 5. Symposia 6. Lake Hefner, Oklahoma. I. U. S. Weather Bureau II. U. S. Geological Survey.** —*A.A.*

5.3–14 621.396

Vvedenskiĭ, Boris Alekseevich (*ed.*), **Issledovaniia po rasprostraneniu radiovoln.** [Investigations of radio wave propagation.] Moscow, Akademiia Nauk, SSSR, **1948.** 214 p. tables, graphs, eqs. Note: This is v. 2 of a work entitled: **Noveĭshie issledovaniia rasprostraneniia radiovoln.** [Newest investigations of radio wave propagation.] Ed. by L. I. Mandel'shtam and N. D. Papaleksi, in 1945. **DLC**—A collection of five papers presenting the theory of electromagnetic propagation on a flat earth, a spherical earth, diffraction and refraction in a homogenous atmosphere; reflection from shore line or sea surface, from mountains, etc. The solutions are in great detail but are only approximations since no account is taken of meteorological conditions. *Subject Headings:* **1. Radio wave propagation 2. Atmospheric refraction. I. Mandel'shtam, Leonid Isaakovich** (*ed.*) **II. Papaleksi, Nikolaĭ Dmitrievich** (*ed.*) **III. Leontovich, M. A. IV. Fok, V. A. V. Feĭnberg, E. L. VI. Grinberg, G. A.**—*M.R.*

GENERAL METEOROLOGY

See also: **Linke's Meteorologisches Taschenbuch, 5.3–8.**

5.3–15 551.5(058)(41)

*Great Britain. Meteorological Office, **Annual report of the Director . . . presented by the Meteorological Committee to the Secretary of State for Air for the year April 1, 1952 to March 31, 1953.** London, H.M. Stationary Office, **1953.** 56 p. M.O. 573. **DWB**—This report follows the pattern of previous years, describing the organizations for forecasting, climatology, marine and agricultural meteorology, and research including instrument development. A list of publications issued during the year is included. *Subject Headings:* **1. Annual meteorological reports 2. Great Britain.**—*C.E.P.B.*

5.3–16 551.5(26):550.34:532.593

Kammer, Erwin and Dinger, J. E. (*U. S. Naval Res. Lab.*), **The aerologist puts an ear to the ground.** *U. S. Office of Naval Research, Research Reviews,* March **1952.** p. 26–30. 4 figs. **DWB**—Investigations of coastal microseisms as to their correlation with water wave activity, are reported. It is pointed out that information obtained from the observation of microseisms could usefully complete the inadequate weather data received from vast ocean areas. A few microseismic storms observed in September and October 1951 are described and data on microseisms measured at Atlantic coast stations presented and compared with corresponding wave activity. *Subject Headings:* **1. Microseisms 2. Marine meteorology 3. Wave action 4. Atlantic Coast.**—*G.T.*

5.3–17 551.5:06(71)

Benum, F. W. (*Continental Aviation Weather Ser., Met. Div. Toronto*), **The Canadian Branch—Royal Meteorological Society.** *Royal Meteorological Society, Canadian Branch, [Publications],* 4(1):1–9, **1953.** graph, 6 refs. **DWB**—Canadian Branch of R.M.S., established in 1940 with 34 members, now has a membership of 360, both professional and interested laymen. Current separate publication, dealing with Canadian problems, proposed. *Subject Headings:* **1. Meteorological societies 2. Royal Meteorological Society, Canadian Branch 3. Canada.**—*A.A.*

5.3–18 551.5:06(058,699)

British Caribbean Meteorological Service, Port-of-Spain, Trinidad, **First annual report, 1952.** Trinidad, Govt. Print. Off., **1953.** 23 p. **DWB**—The status of the several meteorological services of the British Colonies in the Caribbean area as of April 1951 is reviewed, the new organization set up in 1951 to provide a unified service for the area outlined, and the status at the end of the first year described. The service embraces the Bahamas, Barbados, British Guiana, British Honduras, Jamaica, the Leeward Islands, Trinidad and Tobago, and the Windward Islands. Besides the service for aviation, the report covers hurricane warning, forecasting, climatological and library services and finances, staff, aerological observations, etc. A list of sixteen 1951 and 1952 hurricanes which hit the area is appended. *Subject Headings:* **1. Meteorological services 2. Annual service reports 3. Hurricanes 4. British West Indies 5. British Guiana 6. British Honduras. I. Grinsted, W. A.**—*M.R.*

5.3–19 551.5:06(51)

Cheng, Chwen-shu (*Shanghai Observatory*), **Central Weather Bureau of China. A brief survey, May 1949.** 6+ p. 4 tables. Appended: *China. Central Weather Bureau, Nanking, Weather Radio Bulletin*, No. 1–2, May–June **1948.** Typescript. **DWB**—A list of 85 weather stations of the Chinese Weather Bureau as of May 1948 with type of station (airport, pibal forecast center, synoptic and climatological) and equipment. Communication, training and other organizational details and problems are outlined. Forecasts, broadcasts and services to airways, shipping, fisheries and the climatological and daily weather bulletins are also listed. The change over from CAA to National Communications Control is mentioned. *Subject Headings:* **1. China. Central Weather Bureau, Nanking 2. Chinese meteorological network 3. Communications networks 4. Meteorological networks.**—*M.R.*

5.3–20 551.5:06(914)

Del Rosario, Casimiro (*Philippines Weather Bur.*), **The post war Weather Bureau and its national and international services.** *Philippines. Weather Bureau, The Elements*, 4(4):3, 5, 13, April **1953. DWB**—Wartime events led to practically complete destruction of installations and records of the Philippine Weather Bureau. Following the Philippines Rehabilitation Act passed by the U. S. Congress in 1946 more than 3 million pesos have been spent on reconstruction, procurement of instruments and training of personnel. This expense and the regular annual appropriation—the author states—is justified in view of the valuable services rendered by the Weather Bureau, especially to aviation. The Bureau's typhoon forecasting and warning service, flight briefing service, collection of climatic data, geophysical and astronomical services are outlined. *Subject Headings:* **1. Meteorological services 2. Philippines Weather Bureau.**—*G.T.*

5.3–21 551.5:06(09)(914)

Estoque, Mariano A. (*Philippines Weather Bur.*), **History of the national weather service and present meteorological research in the Philippines.** *I.U.G.G. Association of Meteorology, Brussels, 1951, Rapports Nationaux*, p. 94–96, June **1952.** 3 refs. **DWB**—Philippines Weather Bureau established as a private observatory in 1865, official weather service since 1884. Research concentrated now on a classification of air masses according to BERGERON. Microseismic studies and investigations in rain forecasting started. *Subject Headings:* **1. Meteorological research 2. History of meteorological services 3. Philippines Weather Bureau.**—*A.A.*

5.3–22 551.5:06(09)

Ferreira, Herculano Amorim (*Portugal, Met. Service*), **Climatologia física e climatologia médica. Palestra realizada na Sociedade Portuguese de Hidrologia Médica, Lisboa, 12 Dez. 1951.** [Physical climatology and medical climatology. Lecture before the Sociedade Portuguese de Hidrologia Médica, Lisbon, Dec. 12, 1951.] *Portugal. Serviço Meteorológico Nacional, RT* 100, MEM 13, Dec. **1951.** 8 p. **DWB**—The author gives an account of the history of meteorological observations in Portugal and of the Portuguese Meteorological network, which includes the colonies; the organization of the Portuguese Meteorological Service and its activities and lists the Portuguese publications containing meteorological statistics and the titles of climatic studies on Portugal (in Portuguese). *Subject Headings:* **1. History of meteorological services 2. Medical meteorology 3. Portuguese Meteorological Service 4. Bibliographies 5. Portugal.**—*I.L.D.*

5.3–23 551.5:06

Gleiter, Theodore Paul, **The use of scientific personnel in administrative positions in the United States Weather Bureau.** Thesis (*M.A.*)—American University, Wash., D. C., March **1952.** 156 p. 6 figs., 22 tables, bibliog. p. 136–142. Typescript. **DWB**—Administrative set-up of the Bureau's Central Office, five regional offices and field offices is analyzed in detail, with emphasis on the description of positions and of educational standards qualifying for them. Maps showing field administrative regions, district, aviation and river forecast centers, and climatological sections and centers are presented. Comprehensive lists of positions available, including vacant positions, are offered. In addition to being a valuable source of

practical information to those desiring an over-all view of Weather Bureau administration, the thesis gives a detailed outline of the Bureau's history, aims and development, as observed by the social-science scholar. The author also reviews existing literature and experience concerning staffing administrative positions in a scientific organization. *Subject Headings:* **1. U. S. Weather Bureau 2. Meteorological careers.**—*G.T.*

5.3–24 551.5:06

Junge, Christian, **Tagung der Deutschen Geophysikalischen Gesellschaft und der Meteorologischen Gesellschaft in Hamburg.** [Meeting of the Deutsche Geophysikalische Gesellschaft and Meteorologische Gesellschaft in Hamburg.] *Umschau*, 52(19):598, Oct. 1, **1952. DLC**—Brief account of meeting Aug. 24–29, 1952, with summaries of a number of meteorological contributions. *Subject Headings:* **1. Meteorological societies 2. German Meteorological Society 3. German Geophysical Society.**—*C.E.P.B.*

5.3–25 551.5:06

Kéri, Menyhért, **Nemzetközi meteorológiai és hidrológiai kongresszus Magyarországon 1952. november 26–29-én.** [International meteorological and hydrological conference in Hungary on Nov. 26–29, 1952.] *Időjárás*, 56(11/12):331–332, Nov./Dec. **1952.** List of lectures p. 390. **DLC**—Resolutions (concerning development of meteorological research and education in Hungary) passed by the committees for synoptic meteorology and for climatology and agricultural meteorology at a meteorological and hydrological conference held in Nov. 1952 are listed. The conference was attended by representatives of Germany, Czechoslovakia, Poland and Romania. *Subject Headings:* **1. Meteorological conferences 2. Hydrologic conferences.**—*G.T.*

5.3–26 551.5:06

Max-Planck-Gesellschaft zur Förderung der Wissenschaften, Tätigkeitsbericht für die Zeit vom 1.4.1951 bis 31.3.1952. [Report of work for the period from Apr. 1, 1951 to March 31, 1952.] *Naturwissenschaften*, 39(19):437–445, Oct. **1952. DWB**—Report of chemical, physical and technical institutes includes research on: 1) flow (laminar and turbulent), friction and viscosity; 2) physics of the stratosphere (cosmic and UV radiation, freezing of supercooled water); 3) ionosphere. *Subject Heading:* **1. Max-Planck-Gesellschaft.**—*C.E.P.B.*

5.3–27 551.5:06

Namias, Jerome, **Presentation of A.M.S. awards, January 28, 1953.** *American Meteorological Society, Bulletin*, 34(2):76–77, Feb. **1953.** 2 photos. **DWB**—An article based on NAMIAS's speech in tribute to ROSSBY on the occasion of the second presentation of the Societies Award for Extraordinary Scientific Accomplishment. The award was presented by two of his former students, NAMIAS and H. R. BYERS, President of the Society. A second award was given to VERNON CRUDGE, Director of the Munitalp Foundation, for the outstanding contribution of this corporation to the advance of meteorology. The Foundation was established by ALBERT W. JOHNSTON of Greenwich, Conn. a few years prior to his death in Aug. 1952. It has assisted in financing the publication of BJERKNES, BERGERON, GODSKE and BUNDGAARD's new text "Dynamic meteorology and weather forecasting" and is making possible the joint A.M.S. and Royal Meteorological Society meeting at Toronto in Sept. 1953. *Subject Headings:* **1. Special awards 2. American Meteorological Society. I. Rossby, Carl G. II. Crudge, Vernon III. Munitalp Foundation.**—*M.R.*

5.3–28 551.5:06(09, 71)

†*Rae, R. W., **Canadian meteorology.** (In: **Encyclopedia Arctica. v. 7, Meteorology and Oceanography,** [unpub. ms., photostat, July **1951.** Pt. 2] charts, maps (fold.), 38 refs.) **DWB**—An excellent treatise on the history of the Canadian weather service (and previous meteorological observations and reports from the earliest days), the Arctic weather stations in Canada and the principal voyages in which Canada or Canadians participated. A detailed list of Arctic weather stations in Canada gives coordinates, elevation, length of record and

names of observers. The two polar years (1882–3 and 1932–3) and the joint U. S. and Canadian Arctic network are given special attention. A description, with illustrative data of the climate of various parts of the Canadian Arctic is of particular value as it contains data summarized through 1945 or 1950. Biographies of the directors from 1841 to date, a good bibliography and numerous charts add to the value of this report. *Subject Headings:* **1. Canadian Weather Service 2. History of meteorological services 3. Climate of the Canadian Arctic 4. Canadian Arctic.**—*M.R.*

5.3–29 551.5:06:629.13

Reichelderfer, Francis Wilton (*U. S. Weather Bur.*), **Recent progress in meteorological service for aviation.** Aug. **1939.** 9 p. Typescript. **DWB.** Also in: *National Aeronautics*, Wash., D. C., 17(9):44–45, Sept. **1939. DLC**—A short discussion of the improvements in upper air observations in the U. S. Weather Bureau by means of radiosondes to replace airplane soundings and intensified networks of pilot balloon stations as well as expansion of the surface reporting network, Alaskan stations and transfer of city offices or synoptic observations to airports—as of 1939. *Subject Headings:* **1. Airways meteorological services 2. U. S. Weather Bureau network.**—*M.R.*

5.3–30 551.5:06

Technical Assistance Programme. *World Meteorological Organization, WMO Bulletin*, 2(3):80–83, July **1953. DWB**—In connection with the 22nd and 23rd meetings of the UN Technical Assistance Board held at New York in Dec. 1952 and March 1953, the WMO participation in the technical assistance program for which appropriations were granted in those meetings is outlined. The WMO program comprises six projects with Bolivia, China, the Dominican Republic, Israel, Libya and Yugoslavia as beneficiaries. *Subject Heading:* **1. WMO Programme of Technical Assistance.**—*G.T.*

5.3–31 551.5:06

Weickmann, L. I., **Der Deutsche Wetterdienst in der US-Zone 1945–1952.** [German Weather Service in the U. S. Zone.] *Germany. Deutscher Wetterdienst in der US-Zone, Mitteilungen*, No. 16, Dec. **1952.** 32 p. maps (fold.) **DWB**—Administrative report on the establishment and development of the Weather Service in the US Zone. Maps show location of weather bureaus, observatories and research stations, communication lines, first order climatic stations and precipitation stations, location of stations with long period records, frost penetration observation points and phenological stations for 1952 and partly for 1946. *Subject Headings:* **1. Administrative reports 2. Meteorological networks 3. Germany.**—*A.A.*

5.3–32 551.5:92

Prof. Francesco Vercelli. *Nature*, London, 171(4345):241, Feb. 7, **1953. DWB**—Died Nov. 24, 1952, aged 69. Director of Geophysical Institute of Trieste since 1920 and also Thalassographical Institute since 1949. Wrote on transmission of solar radiation through sea water, effect of wind and pressure on tides, periodogram analysis of pressure, etc. and book on meteorology "L'Aria." *Subject Headings:* **1. Biography 2. Vercelli, Francesco.**—*C.E.P.B.*

5.3–33 551.5:92 551.54(09)

Schimank, Hans, **Otton von Guericke.** *Naturwissenschaften*, 40(15):397–403, Aug. 1, **1953. DWB**—VON GUERICKE was born in Magdeburg in Nov. 1602, educated at Leipzig University. Though a politician he found time for scientific investigation, especially in applied mathematics. Becoming interested in the problem of "empty space" he experimented with evacuated copper spheres, and discovered the pressure of the air. He discussed causes of clouds and wind, and with a "weather mannikin" based on the barometer, he successfully forecast a severe storm in 1660. He organized the first comparative barometer observations in Germany, also investigated frictional electricity. Died May 1686. *Subject Headings:* **1. Biography 2. von Guericke, O. 3. History of Meteorology.**—*C.E.P.B.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Linke's Meteorologisches Taschenbuch**, 5.3–8; **Radar in short range forecasting** (U. S. Bur. of Aeronautics), 5.3–90; **Vertical isobar relative motion in geostrophic advection** (Dahler), 5.3–99; **Tables of relative density of humid air** (Rickwood), 5.3–112.

5.3–34 551.501.7:551.521.7

Powell, Cecil Frank, **Freiballonflüge in grossen Höhen. Neue Elementarformen der Materie.** [Free balloon flights in great heights. New elementary forms of matter.] *Naturwissenschaftliche Rundschau*, 6(10):397–405, Oct. **1953.** 7 figs., table. **DWB**—A "rain" of very high energy particles strikes the upper atmosphere producing all kinds of mesons. The study of these requires experiments with balloons at high altitudes. Expeditions for this purpose, and their results, are described, with photographs of meson tracks. The elementary forms of matter are listed and their properties tabulated. The heavy charged "Kappa meson" is included. *Subject Headings:* **1. Corpuscular radiation 2. Mesons.**—*C.E.P.B.*

5.3–35 551.501.8:551.515.4

Airborne radar: flight operations round table. *Skyways*, New York, 12(5):20–23, 36–50, May **1953.** illus. **DWB**—As a result of this round table discussion in which J. J. GEORGE of Eastern Airlines and A. J. MEREWETHER of American Airlines took part as meteorologists, it was concluded that the most useful function of air-borne radar is its ability to detect areas of rain and, incidentally areas of severe turbulence, icing or thunderstorm activity while flying in storm areas, thus giving the pilot confidence and often enabling him to avoid such areas. The ability to anticipate terrain obstructions on the flight path and navigational use are of lesser importance. If the radar is to detect rain areas it must be of a different frequency than it would be if its use is to get a clear picture of terrain or of other aircraft obviously without interference by rain areas. The frequencies used are 3 cm for rain, 10 cm for terrain warning (or even 10 m). *Subject Headings:* **1. Air-borne radar 2. Radar thunderstorm detection 3. Aeronautical meteorology. I. George, J. J. II. Merewether, A. F.**—*M.R.*

5.3–36 551.501.8:551.558

Barratt, P. and Browne, I. C., **A new method for measuring vertical air currents.** *Royal Meteorological Society, Quarterly Journal*, 79(342):550, Oct. **1953.** 4 refs. **DWB**—A radar beam directed vertically on a cloud is split and part of it deflected on to a suitable ground target, and the frequencies of the two echoes are compared. The shift of frequency of the cloud echo gives the velocity of cloud droplets relative to the radar beam. Preliminary observations in a shower at Cambridge gave a downdraught of 2 m/sec. *Subject Headings:* **1. Radar wind measurement 2. Vertical velocities.**—*C.E.P.B.*

5.3–37 551.501.8:551.510.535

Gardner, F. F. and Pawsey, J. L., **Study of the ionospheric D-region using partial reflections.** *Journal of Atmospheric and Terrestrial Physics*, 3(6):321–344, July **1953.** 18 figs., 2 tables, 9 refs., 6 eqs. **MH-BH**—A method is described of regularly observing echoes at vertical incidence down to 60 km, using high sensitivity on ? Mc/s at a low-noise site near Sydney, Australia, and of determining electron density and collision frequency from them. It is found that the ionosphere below the normal E region includes a region at about 70 km with maximum ionization at midday, disappearing at night, and one at 90 km extending up to normal E region and, by day, descending to merge with lower region. This is the main cause of medium and short wave attenuation. *Subject Headings:* **1. Ionospheric structure 2. D-layer.**—*C.E.P.B.*

5.3–38 551.501.8:551.510.535

Hepburn, F. and Pierce, E. T., **Atmospherics with very low-frequency components.** *Nature*, London, 171(4358):837–838, May 9, **1953.** 4 refs. **DWB**—The 'slow tail's' (100–500 c/s) parameters of atmospherics: t, time between start of main oscillation and commence-

ment of slow tail, and quarter cycle $\tau/4$ of the tail are represented for distances D up to 5000 km by $t = k(D-D_0)$ and $\tau/4=\tau_0+cD$; $D_0=1000$ km and τ_0 500μ sec. By day $k=0.33$ and $c=0.23$; by night $k=0.13$ and $c=0.08$. The results indicate propagation between earth and an equivalent homogeneous ionospheric layer, height 65 km and conductivity 5×10^3 e.s.u. by day, 90 km and 11×10^4 by night. *Subject Heading:* **1. Sferics from ionosphere.**—*C.E.P.B.*

5.3–39 551.501.8:551.510.535:551.557

Somayajulu, Y. V.; Rao, B. Ramachandra and Rao, E. Bhagiratha, **Investigation of travelling disturbances in the ionosphere by continuous-wave radio.** *Nature*, London, 172(4383):818–820, Oct. 31, **1953.** 3 figs., 9 refs. **DWB**—The first letter describes a simple method using continuous short-wave signals and oblique-incidence pulses from Madras recorded at Waltair, 640 km distant. A typical record indicates velocities of 200–400 m/s, larger and less uniform by day than by night. The second letter describes a similar method using two short-wave transmissions on close wave lengths. *Subject Headings:* **1. Ionospheric winds 2. Radio observation.**—*C.E.P.B.*

5.3–40 551.501.81:551.577

Austin, Pauline M. (*M.I.T.*), **Study of the amplitude distribution function for radar echoes from precipitation.** Massachusetts Institute of Technology. Dept. of Meteorology, Weather Radar Research, Contract DA-36-039-sc-124, Technical Report No. 17, May 31, **1952.** 36 p. 5 figs., 6 refs., eqs. **DWB**—Various observed amplitude distribution functions are compared with the theoretical expectations given by KERR and a fairly good agreement was found using better calibrated measurements. Theoretical derivations for groups of scatterers in random position are given. *Subject Headings:* **1. Radar precipitation echoes 2. Microwave scattering. I. Massachusetts Institute of Technology. Dept. of Meteorology. Weather Radar Research II. Contract DA-36-039-sc-124.**—*A.A.*

5.3–41 551.501.81:551.577

Day, G. A., **Radar observations of rain at Sydney, New South Wales.** *Australian Journal of Physics*, 6(2):229–239, June **1953.** 2 figs., table, 7 plates, 10 refs. **DWB**—The radar echoes received from rain during systematic observations carried out from January 1950 to January 1951 at the Radiophysics Laboratory, Sydney, N.S.W., are illustrated and described. Examples of echoes from melting and upper bands, non-freezing and frontal showers, thunderstorms, and echo masses are shown by vertical cross sections of the atmosphere through the point of observation. Correlation between the rain echo and the prevailing weather situation shows that the melting-band rain, which over this period was responsible for most of the rainfall, is usually associated with low pressure, whereas non-freezing showers are shown to be more frequently associated with high pressure. *Subject Headings:* **1. Radar precipitation echoes 2. Radar echoes 3. Sydney, New South Wales.**—*Author's abstract.*

5.3–42 551.501.81:551.577

Farnsworth, G. W.; Jones, D. M. A.; Neill, J. C. and Stout, G. E., **Research study on intensity of surface precipitation using radar instrumentation.** Illinois. State Water Survey. Meteorological Laboratory, Contract DA36-039-sc-42446, Project DA 3-99-07-022, Project Sc 24-172b, Fourth Quarterly Technical Report, March 1–May 31, **1953.** 16 p. 2 tables. **DWB**—Progress achieved in radar installation, modification, maintenance, development and operation and in control measurement of drop size (flash tubes, raindrop camera, etc.) and rainfall (reactivation of raingage networks) is summed up. The operational part of the report includes details of radar measurement and tabulated data obtained in the 50-gage Goose Creek control network (April–May 1953). Results of the rain gage measurements are compared with those obtained by radar on April 9 and 24 and May 6–7. The comparison reveals errors of 400% and 308% respectively for the first and second date, while complete agreement was achieved on the third. *Subject Headings:* **1. Radar precipitation measurement 2. Precipitation measurement. I. Illinois. State Water Survey. Meteorologic Laboratory II. Contract DA36-039-sc-42446.**—*G.T.*

5.3–43 551.501.81:551.577.11

Hitschfeld, Walter and Berdan, Jack, **Errors inherent in the radar measurement of rainfall at attenuating wavelength.** McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-12, May 1953. 34 p. figs., refs., eqs. Also in: *Journal of Meteorology*, 11(1):58–67, Feb. 1954. **DWB**—The equation

$$R = \frac{r^{B/A}\, e^{y/A}}{\left[\left(\frac{1}{a}\right)^{\alpha} - \frac{\alpha C}{A}\int_0^r r^{B\alpha/A}\, e^{y\alpha/A} dr\right]^{1/\alpha}}$$

for the rate of rainfall R at range r from the radar is derived. Here A and B are numerical constants; C and α are defined by the relation: radar attenuation due to intervening rain (in db) $= C\int R^{\alpha}\, dr$. The constant a measures the performance of the radar, and is determined by direct calibration. The quantity y is the power level of the received signal, corrected for attenuation by intervening cloud and atmospheric gases. *Subject Headings:* **1. Radar rainfall measurement. I. McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group II. Contract AF 19(122)-217.**—*Authors' abstract.*

5.3–44 551.501.81:551.577

Lhermitte, Roger, **Les "bandes supérieures" dans la structure verticale des échos de pluie.** [The "upper bands" in the vertical structure of rain echoes.] *Académie des Sciences, Paris, Comptes Rendus*, 235(22):1414–1416, Dec. 1, **1952.** fig., 3 refs. **DWB**—Observations made at Magny-les-Hameaux with 2 radars operating simultaneously at 3.2 cm wave length, give the horizontal and the vertical structure of precipitation echoes and their speed of movement in both planes. Three types of "upper bands" are described and illustrated, and formulas derived which agree with their observed speed of fall, indicating that they are produced by snowflakes fusing with raindrops. *Subject Headings:* **1. Bright band echoes 2. Upper band radar echoes 3. Radar precipitation echoes.**—*M.R.*

5.3–45 551.501.81:551.594.6

Fleisher, Aaron, **The information contained in weather noise.** Massachusetts Institute of Technology. Dept. of Meteorology. Weather Radar Research, Contract DA-36-039-sc-124, Project DA 13-99-05-022, Project 22, Technical Report, No. 22, Pt. A, Jan. 15, **1953.** 27 p. 3 refs., eqs. **DWB**—The fluctuating radar signal (phase and amplitude) from clouds and precipitation regarded as a kind of noise was treated as a statistical time series. A second probability density function was investigated and the computed normal autocorrelation was derived directly from the expression for the signal envelope. *Subject Headings:* **1. Radar observation 2. Radio noise. I. Massachusetts Institute of Technology, Dept. of Meteorology. Weather Radar Research II. Contract DA-36-039-sc-124.**—*W.N.*

5.3–46 551.501.9:551.508.85(42)

Chilton, D., **A recording radar-sonde station.** *Weather*, 8(10):315–316, Oct. **1953. MH-BH**—Description of a Meteorological Office Station at Pease Pottage, near Crawley, Sussex, with range and accuracy of observations of wind vector, height, temperature, pressure humidity. Slant range is 100 mi. *Subject Headings:* **1. Radarsonde stations 2. Crawley, England.**—*C.E.P.B.*

5.3–47 551.501.9:551.43

Korff, Serge A., **A survey of Alaskan peaks.** *Physics Today*, 5(7):18–20, July **1952. DWB**—An extensive survey of most of the high peaks in Alaska revealed the fact that the peaks of the Wrangell group (14,000 ft) would be the easiest on which to install and maintain a high altitude observation station, Mt. Hayes would be next and Mt. McKinley the hardest and most expensive (because of weather conditions which make landing equipment and later supply by airplane difficult). All of these peaks lie within one half degree geomagnetic latitude of each other, and as air is denser in the Arctic than in lower latitudes, 13,400 ft in Alaska gives same atmospheric rarifaction as 14,200 ft (Mt. Evans) in Colorado. *Subject Headings:* **1. High altitude observatories 2. Mt. Wrangell, Alaska.**—*M.R.*

5.3–48 551.501.9(09)

Lamoureux, Clarence Eugene, **Historic meteorological landmark disappears.** March 3, **1953.** 4 p. Typescript. **DWB**—On the occasion of the razing, in the early spring of 1953, of the observatory established by GUSTAVUS HINRICHS at Iowa City the author gives a few notes on the history of that observatory and of the Iowa Weather Service which was organized by HINRICHS in 1875. He began his records at the Univ. of Iowa in Dec. 1871, and a cooperative service with 60 observers in Iowa in Oct. 1875. By 1877 there were 87. He wrote numerous scientific papers on meteorology, corresponded with BUCHAN, DAVY, BUYS-BALLOT, WILD and HILDEBRANDSSON and published the *Iowa Monthly Weather Review*. *Subject Headings:* **1. Hinrichs, Gustavus 2. Iowa Weather Service 3. History of observatories 4. Cooperative observers 5. Iowa City, Iowa.**—*M.R.*

OBSERVATIONAL DATA

5.3–49 551.506:551.553.6:551.584.3(439.1)

*Kakas, József, **Adatok hazánk évszkonkénti széliránygyakoriságaihoz.** [Data on seasonal wind direction frequencies in Hungary.] *Időjárás*, 56(1/4):22–35, Jan./April **1952.** 2 tables, 16 charts. Russian and German summaries p. 121–123. **DLC**—Data on seasonal wind direction and velocity frequencies over 16 airfields in and around Hungary (17 observations daily, 1940–1943) are presented in tables and charts. Attention is called to a definite effect of the Carpathians on wind directions in Hungary. *Subject Headings:* **1. Wind frequencies 2. Topographic effects 3. Hungary.**—*G.T.*

5.3–50 551.506:654.94

Menzel, Willi, **Das europäische Ursigramm.** [The European ursigram.] *Umschau*, 52(24):758, Dec. 15, **1952.** **DWB**—Account of the solar, geomagnetic and ionosphere data now distributed in Europe by telegraph and telephone from the German Federal Post. *Subject Heading:* **1. Ursigram.**—*C.E.P.B.*

5.3–51 551.506(64)

Rogers, Peter, **An autumn tour.** *Weather*, 8(7):214–216, July **1953.** **MH-BH**—Popular account of weather during an Oct.–Nov. tour, mainly in Morocco. *Subject Headings:* **1. Weather 2. Morocco.**—*C.E.P.B.*

5.3–52 551.506:551.524:551.525.4(68)

*South Africa. Meteorological Office, **Temperatuur.** [Temperature.] Pretoria, March **1942.** 166 p. numerous tables. In English and Afrikaans. **DWB**—The third in a series of extensive compilations of climatic data for South Africa (the first was on winds and the second on pressure and synoptic charts, both published in 1941). This volume comprises an analysis of all available (to 1940) data from first order aerological and second order stations, presented in the form of isothermal and adiabatic charts, graphs, frequency tables and tables of mean and extreme monthly values. The elements represented are actual mean and extreme temperatures, sea level isotherms, interdiurnal variability and frequency of maximum and minimum temperatures (30 stations), variability of monthly temperature, frost dates, durations and frequencies (220 stations), topographical influences on frost, exceptionally heavy frost, upper air pressure, temperature and humidity 1 to 10 ft depth; hourly mean temperatures, earth temperatures (10 stations) for specific heights and pressure at Cape Town, Pretoria and Walvis Bay. Mean maximum, minimum and mean monthly temperatures are for standard 20-year period 1921–40; all other data are for entire period of record. *Subject Headings:* **1. Temperature data 2. Frost data 3. Soil temperature data 4. South Africa.**—*M.R.*

5.3–53 551.506:551.524.36

Wilson, R. E. (*Natl. Bureau of Standards*), **Standards of temperature.** *Physics Today*, 6(1):10–15, Jan. **1953.** 5 figs., table, 10 refs. **DLC**—Fixed points of the internationally adopted temperature scales of 1927 and 1948 are discussed. The use of three standard instruments (platinum resistance thermometers, platinum-platinum rhodium thermocouples,

and optical pyrometers) is described in general terms. The emphasis is on techniques which are being developed at NBS for improving the accuracy of measurement at extremely low (4–1°K) and extremely high (up to 3,800°F) temperatures. The author also briefly deals with new temperature measurement problems connected with the operation of jet aircraft (such as the measurement of flames, etc.) and with flight at high altitude or in polar regions. *Subject Headings:* **1. Extreme temperature measurement 2. Jet aircraft.**—*G.T.*

5.3–54 551.506(26)

*Thomsen, Helge, **Hydrografiske Undersøgelser i Limfjorden 1943. I. Observationsmaterialet.** [Hydrographic investigation in Lim Fjord 1943. I. Observational material.)] *Denmark. Meteorologiske Institut, Meddelelser*, No. 9, **1947.** 104 p. 6 figs., numerous tables, fold. map, eqs. **DWB**—This report represents a valuable addition to the previously scanty data available for the Lim Fjord. Surface currents, sea level, temperatures, salinities, oxygen content and winds observed on board 64 lightships and the hydrographic vessel "Biologen" are tabulated. *Subject Headings:* **1. Marine meteorological data 2. Ocean weather stations 3. Lim Fjord, Denmark.**—*M.P.K.*

5.3–55 551.506.1:551.577(236)

*East Africa High Commission. Meteorological Dept., **Bulletin of daily rainfall for the year 1951. Part IV, Zanzibar.** Mostly tables. On inside of t-p: **Summary of rainfall recorded in Zanzibar and Pemba for the year. . . . DWB**—Daily rainfall values, together with total monthly, number of days, average length of record, greatest daily rainfall and date thereof, are given for each of 21 stations in Zanzibar and Pemba, for each month of 1951. An annual summary (by months) with comparable data is also included. *Subject Headings:* **1. Rainfall data 2. Daily weather bulletins 3. Zanzibar 4. Pemba 5. East Africa.**—*M.R.*

5.3–56 551.506.1(86)

*Federación Nacional de Cafeteros de Colombia, Bogotá, **Anuario Meteorológico para el año de 1950.** [Meteorological Annual for 1950.] Chinchina, Centro Nacional de Investigaciones de Cafe, June **1951.** unpaged. 31 tables, graphs, photos. **DWB**—Elaborate meteorological observation plots are described and the layout shown photographically. Complete daily and monthly data are presented for mean, maximum and minimum air temperature, precipitation, vapor pressure, relative humidity, sunshine duration and soil surface temperature for the year 1950 at Chinchina, Caldro (4°58'N, 75°37'W, 1360 m elevation) and Esteban Jaramillo (Venecia), and more limited data (temperature and precipitation) for La Florida (Popayan), El Libanol (Tolima), Blenay (N. Satander) and La Bella (Calarcia, Caldro) all in the coffee growing regions of Colombia. A map shows location of stations. Average monthly data are shown on graphs and histograms, and lengthy description of the observational program, use of the data and the annual course of the meteorological elements for each station given. The percentage of rain each month during day and night is shown graphically, along with probability and intensity of rain. *Subject Headings:* **1. Meteorological networks 2. Annual meteorological reports 3. Observational data 4. Colombia. I. Centro Nacional de Investigaciones de Cafe, Chinchina, Colombia II. Callego, L. Jose J.** (*ed.*).—*M.R.*

5.3–57 551.506.1(43)

*Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, **Deutsches Meteorologisches Jahrbuch, 1951, Teil IV, Heft 2, Beobachtungen des Meteorologischen Observatoriums Wahnsdorf.** [German Meteorological Yearbook, 1951, Vol. 4, Pt. 2, Observations of the Wahnsdorf Meteorological Observation.] Berlin, Akademie-Verlag, **1953.** 124 p. mostly tables. **DWB**—Standard meteorological data, including soil temperature, are presented *in extenso* for observations made three times daily (7, 14, 21) according to the tradition in the German network and also four times daily (1, 7, 13, 19—mean local time) in connection with new requirements. Hourly data are given for atmospheric pressure, temperature, vapor pressure, relative humidity, sunshine, precipitation, wind (2.5 and 25 m) cooling power, solar radiation and atmospheric electricity. *Subject Headings:* **1. Observational data 2. Annual meteorological reports 3. Wahnsdorf Observatory, Germany.**—*A.A.*

5.3–58 551.506.1(058)(43)

*Germany. Deutscher Wetterdienst in der US-Zone, **Deutsches Meteorologisches Jahrbuch, 1939. Teil I. Tägliche Beobachtungen. 1949.** 216+p. **Teil II. Monats- und Jahresergbnisse. 1950.** 156+p. **Teil III. Niederschlagsbeobachtungen. 1949.** p. 673–896+. [German Meteorological Yearbook, 1939. Pt. I. Daily observations. Pt. II. Monthly and yearly results. Pt. III. Precipitation Observations.) tables. **DWB**—Station index and location chart, frost, snow cover, sunshine and earth temperature (12 stations) measurements in addition to all kinds of temperature, wind pressure, cloudiness, rain, snow, hail, fog and thunderstorm data for first and second order stations in all of pre-war Germany. *Subject Headings:* **1. Climatic data 2. Annual meteorological reports 3. Germany.**—*M.R.*

5.3–59 551.506.1(058)(43)

*Germany. Deutscher Wetterdienst in der US-Zone, **Deutsches Meteorologisches Jahrbuch, 1952, Teil II: Monats- und Jahresergebnisse.** [German Meteorological Yearbook, 1942, Pt. II: Monthly and yearly data.] Bad Kissingen, **1952.** 126 p. mostly tables, map (fold.) **DWB**—In this yearbook, published after many years, the location of stations and the elements recorded, the monthly and annual data for first, second and third order stations, dates of frost and snow cover and sunshine duration and soil temperature data, are presented in the usual form. A large chart shows the station network for all of Germany as of 1942. Because of lack of funds, a number of important features previously published were omitted. (*See items* 3.1–32, Jan. 1952 and 3.10–45, Oct. 1952, *MAB* for 1940 and 1949 (U. S. Zone) respectively.) *Subject Headings:* **1. Annual meteorological reports 2. Meteorological data 3. Germany.**—*M.R.*

5.3–60 551.506.1(51)

*Japan. Central Meteorological Observatory, Tokyo, **Monthly report: meteorological observations.** First No. received, Jan. **1944.** Last No. received, April **1952.** Broken holdings for 1944–1946, pub. 1951–1952. entirely tables. **DWB**—Daily values of pressure, temperature, wind, vapor pressure, relative humidity, cloudiness, precipitation, sunshine, etc. and monthly means are given for 145 stations all over Japan. Number of days in each month with precipitation of various depths and temperature extremes are also given. Coordinates and altitudes are given for each station. *Subject Headings:* **1. Monthly climatic data. 2. Monthly data bulletins.**—*M.R.*

5.3–61 551.506.1:63(791)

Jurwitz, Louis R. (*U. S. Weather Bur., Phoenix*), **The march of the weather across 1952.** *Arizona Cattlelog,* Phoenix, Arizona, 8(5):15–18, Jan. **1953. DWB**—A month-by-month description of the weather and crop conditions in Arizona. During several of the months of 1952 (March, April, June and Sept.) heavy rains occurred in most of the State although portions of the State remained dry during *these* months and other portions had heavy rains during *other* months. Past years have been very dry. Temperatures ranged from 17 below zero to +116°F. *Subject Headings:* **1. Annual summaries 2. Crop yield 3. Arizona.**—*M.R.*

5.3–62 551.506.2(421):551.575.5

Stewart, K. H., **Data on fog in London area, December 5–9th, 1952.** Great Britain, Meteorological Office, **1953.** 3 p. 12 plates, table, Mimeog. **DWB**—The fog was 250–300 ft deep and ended abruptly on the hill slopes south of London. Observations every 3 hrs are quoted for Kingsway and Kew Observatory. Maps of extent and density of fog are given at 6 hr intervals. *Subject Headings:* **1. Fog distribution 2. London, England.**—*C.E.P.B.*

5.3–63 551.506.3:551.524.3(42)

Manley, Gordon, **The mean temperature of central England, 1698–1952.** *Royal Meteorological Society, Quarterly Journal,* 79(342):558–567, Oct. **1953.** fig., 3 tables. **DWB**—In this discussion of MANLEY's paper (*see item* 4.9–40, Sept. 1953, *MAB*) J. GLASSPOOLE and other speakers questioned the validity of the methods of reduction. The author replied in great detail. By request he added to his tables seasonal and annual means of temperature for each

year 1698–1952 and long period monthly means. *Subject Headings:* **1. Temperature variations 2. Long period records 3. England. I. Glasspoole, J.**—*C.E.P.B.*

5.3–64 551.506.3:551.524.2(43)

*von Rudloff, Hans, **80-jährige Temperaturmittel für das südliche Oberrheingebiet.** [80-year temperature mean for the southern Upper Rhine region.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:130–138, **1952.** 5 tables, 20 refs. **DWB**—Mean monthly temperatures reduced to 1871–1950 are given for numerous stations, also for districts and different periods. *Subject Headings:* **1. Temperature normals 2. Germany.**—*C.E.P.B.*

INSTRUMENT CARRIERS

See also: **Research in physical properties of upper atmos. with V-2** (Temple Univ. Res. Inst.), 5.3–123; **Stratosphere data** (aufm Kampe), 5.3–197; **Research of physical properties of atmos.** (Temple Univ.), 5.3–326.

5.3–65 551.507.2(261)

North Atlantic weather ships. *Nature*, London, 172(4386):933, Nov. 21, **1953. DWB**—Note on the North Atlantic weather station scheme. The effects of the proposed withdrawal of the U. S. Weather ships are discussed; the main handicap will be the loss of upper air information. *Subject Heading:* **1. Ocean weather stations.**—*C.E.P.B.*

5.3–66 551.507.362:016

†Sutton, G. P. (*North Amer. Avia., Downey, Calif.*), **Rocket propulsion progress: a literature survey.** *American Rocket Society, Journal*, New York, 22(1):17–27, 31, Jan./Feb. **1952.** biblio. p. 22–27, 31. **DLC**—This article presents a summary of the technical progress achieved in the field of rocket propulsion as reflected in the published literature, and is also a guide to outstanding articles in the field. *Subject Headings:* **1. Rocket development 2. Rocket bibliographies.**—*NRL abstract.*

INSTRUMENTS

See also: **Precip. measurement methods for automatic weather stations** (Kurtyka), 5.3–6; **Recording radarsonde station** (Chilton), 5.3–46; **Measuring air density for aircraft gunnery computers** (Colvin), 5.3–111; **Analytical methods in air pollution study** (Kay), 5.3–114; **Evapotranspiration measurement** (Berger-Landefeldt), 5.3–238; **Thundercloud electrification studies** (Chapman), 5.3–319.

5.3–67 551.508.53/4

†Baumbach, S., **Die instrumentelle Seite der Windmessung.** [Wind measurements from the instrumental point of view.] *Germany. Deutscher Wetterdienst. Zentralamt für Nordwestdeutschland, Technische Mitteilungen der Instrumentenabteilung*, No. 22:1–13, Jan. **1953.** 5 diagr., 44 refs. **DWB**—Review on instruments for wind measurements used in the meteorological services, discussing the limits and errors of different types, especially the amplitude reduction and time lag, dependent on wind speed, intensity and duration of gusts and the instrumental characteristics. Anemometers (owing to gusts) can indicate up to 30% more than the true mean wind speed. Furthermore, the indicated wind speed should be corrected for the density of the air. Author proposes to use an inductive indicator of pressure oscillations with an electronic instrumentation (Vibro-Meter Co., Switzerland) as a standard instrument (for the measurement of the microstructure of wind). The instrument registers force, amplitudes and phases. Membrane deviations can be measured with a precision of 10^{-6} mm, that is almost the order of magnitude of atom diameters. *Subject Headings:* **1. Wind instruments 2. Wind measurement 3. Gustiness measurement.**—*A.A.*

5.3–68 551.508.53/4

Bell, J. and Langham, E. M., **Mean-wind-velocity instruments for use on naval craft.** *Muirhead Technique*, Beckenham, Eng., 7(1):3–5, Jan. 8, **1952.** 3 figs. **DWB**—Two electrical instruments are briefly described and illustrated by circuit diagrams. The first is a mean

wind-direction indicator transmitting apparent wind data from a vane mounted on a ship's mast head to an instrument below deck. The other apparatus obtains data from a wind vane and a cup anemometer. Its inputs are wind direction and speed, ship's speed and gyro compass. It indicates apparent mean wind speed and direction. *Subject Heading:* **1. Wind instruments.**—*G.T.*

5.3–69 551.508.51

Bergeiro Hargain, José María (*Seccion Investigaciones Met., Inst. de Estudios Superiores, Montevideo*), **Los modelos de veleta propios de la Sección Investigaciones Meteorológicas.** [The Meteorological Investigation Section's own models of wind vanes.] *Revista Orientación Meteorológica*, Montevideo, No. 3:16–18, Dec. **1948.** figs. **DWB**—Three types of wind vanes produced and offered for sale at production cost ($3.00 and 4.50) by the Met. Investigation Section are described and shown in diagrams. The usefulness of these devices for agriculture and weather forecasting is emphasized. *Subject Heading:* **1. Wind vanes.**—*G.T.*

5.3–70 551.508.54

Nishiyama, H., **On the leakage error of the Dines' pressure tube anemometer.** *Journal of Meteorological Research*, Tokyo, 4(6):332–336, Sept. **1952.** 3 figs., 8 eqs. In Japanese; English summary p. (21–22). **MH-BH**—The error on a record of a Dines pressure tube anemometer resulting from the leakage at the float collar and the rotating connection of the wind vane is calculated and compared with results of wind tunnel experiments made at the Central Meteorological Observatory, Tokyo. *Subject Headings:* **1. Anemometers 2. Instrumental errors.**—*From author's abstract.*

5.3–71 551.508.54:551.584.65

Casella, C. F. & Co., Ltd., London, **Biram's air meter, improved colliery pattern.** *Casella, London, Leaflet* No. 751, [n.d.] 2 p. illus. **DWB**—Robust construction, well protected fan, ease of handling, and large range are mentioned as desirable features of the instrument which is claimed to have proved to be particularly suitable for measuring air currents in localities, such as mines, where space is limited and where a danger of damage by falling material exists. Two models are available, one for air speeds of 150–3,000 ft/min, registering to 100,000 ft and one for air speeds of 50–900 m/min, registering to 100,000 m. *Subject Headings:* **1. Air meters 2. Mine ventilation.**—*G.T.*

5.3–72 551.508.54:629.13:551.551

Murgatroyd, R. J. and James, D. G., **Hot-wire anemometers for use on aircraft.** *Great Britain. Meteorological Research Committee, M.R.P.* 804, April 29, **1953.** 6 p., 12 figs., 6 refs. Mimeo. **GB-MO**—Requirements of a hot wire anemometer to measure gustiness on an aircraft are set out and the design of a temperature compensated platinum wire instrument is illustrated. A directional type to measure vertical gusts in flight is also shown. Flight procedure, calibration and mounting are described and specimen records shown. The simple instrument records gust speeds down to 2 ft/sec and frequencies up to 50 cycles/sec. *Subject Headings:* **1. Hot wire anemometers 2. Turbulence measurement.**—*C.E.P.B.*

5.3–73 551.508.54

Sanuki, M., **A new development of the theoretical and experimental treatment of the lag of Dines pressure tube exposed in fluctuating winds.** *Papers in Meteorology and Geophysics*, Tokyo, 3(2):115–124, Aug. **1952.** 4 figs., 3 refs. **MH-BH**—The equation of motion of the float system in Dines pressure tube established first by S. IKEDA and corrected by the present author is compared with that given by SCHRENK for cup anemometer. The over-estimation factor of integrated record, under-estimation and phase-lag factor of peak indication are obtained by the graphical integration of the equation of motion for the pressure tube exposed in fluctuating winds, if the definition of SCHRENK's parameter is extended to it. The effect of float inertia may safely be neglected. Experiments on the pressure tube, which is started from rest in the wind tunnel, or brought to rest in a still air, are conducted to determine the "SCHRENK's parameter" for various piping conditions. *Subject Heading:* **1. Anemometry.**—*Author's abstract.*

5.3–74 551.508.54

Trevoy, D. J. and Torpey, W. A., **A vacuum anemometer.** *Review of Scientific Instruments*, 24(8):676–682, Aug. **1953.** 8 figs., refs., 12 eqs. **DWB**—A vacuum anemometer is described for indicating or measuring the streaming of gases and vapors in vacuum. The device is particularly useful for measuring the projective vapor emission from liquid surfaces and the flow of gas through pipes, for instance, between a vessel and a pump. The anemometer consists of a propeller mounted on a shaft supported by jeweled bearings, the propeller being driven by the stream of gas. To measure the speed of the propeller, a small AC generator is incorporated in the device, and the output is indicated by an electronic voltmeter. Under conditions of heavy electrical braking, it is shown that the speed is directly proportional to the pressure, independent of the nature of the gas and of its molecular weight. The instrument is rugged, insensitive to vibration, stable, and readily calibrated. It has low inertia and responds rapidly to a change in the momentum of the stream of incident molecules. Sources of error are discussed and typical performance data are reported. *Subject Heading:* **1. Anemometers.**—*Authors' abstract.*

5.3–75 551.508.53/4(02)

Canada. Meteorological Div., **Control tower wind equipment, type U-2-A.** *Canada. Meteorological Div., Cir.* 2109, INS. 37; Manual 50, May 20, **1952.** 10 p. 3 figs., form. **DWB**—A brief manual for installation, operation and maintenance of wind equipment used in Canada on airport towers, meteorological stations and radio ranges. The direction and speed instruments are mounted on the same tower, but are independent of each other. A remote dial indicator is mounted on the standard tower panel or a special cabinet. Wiring and orientation instructions are included. *Subject Headings:* **1. Wind indicators 2. Control tower equipment 3. Instrument manuals 4. Canada.**—*M.R.*

5.3–76 551.508.53/4(02)

Canada. Meteorological Div., **Wind equipment, M.S.C. pattern.** *Canada. Meteorological Div., Cir.* 2039, Ins. 30; Manual 51; Nov. 23, **1951.** 33 p. 8 figs. (1 fold.), table. **DWB**—A manual for use in installation and operation of M.S.C. wind direction and speed recording equipment in use at the synoptic weather stations in Canada. Detailed wiring diagrams and photographs show all the working parts and circuits. The standard equipment includes: 1) an anemovane (combined cup anemometer and wind vane), 2) an anemograph and 3) a visual wind direction and speed indicator. Instructions and tables are also included for orienting the anemovane to true north. *Subject Headings:* **1. Wind recorders 2. Anemovanes 3. Instrument manuals 4. Canada.**—*M.R.*

5.3–77 551.508.54

Sanuki, M., (*Met. Res. Inst., Tokyo*), **Experiments on the start and stop of windmill- and cup-anemometers with particular reference to their over-estimation factors.** *Papers in Meteorology and Geophysics*, Tokyo, 3(1):41–53, March **1952.** 14 figs., 9 refs. **MH-BH**—Three- and four-bladed windmill anemometers and cup anemometers were tested in a wind tunnel. Their responses are compared. The static torque coefficients are calculated from observed rotational speed versus time to be used in SCHRENK's parameter. SCHRENK's over-estimation factors for both anemometers are evaluated and represented in a single chart for rectangular wind waves. For sinusoidal wind waves graphical solution of the equation of motion is carried out, from which the over-estimation factor is computed and compared with experiments made by DEACON. The phase lag is also shown in a chart. *Subject Headings:* **1. Windmill anemometers 2. Cup anemometers 3. Instrument comparisons.**—*Author's abstract.*

5.3–78 551.508.53/4

Sanuki, M. and Kimura, S., **Notes on the design of combination wind vane and anemometer.** *Papers in Meteorology and Geophysics*, Tokyo, 3(4):320–324, March **1953.** 8 figs., 2 refs. **MH-BH**—Wind tunnel experiments on the static directional sensitivity of Speedovane (an experimental combination wind vane and anemometer) and also on the blade shape of its

anemometer windmill are described. *Subject Headings:* **1. Anemometers 2. Wind tunnel experiments.**—*Authors' abstract.*

5.3–79 551.508.53/4

Tommila, Mauri, **Light weight cup anemometer with wind vane for weather report stations and calibration of some cup anemometers in a wind-tunnel.** *Geophysica*, Helsinki, 4(2):54–62, **1953.** 5 figs., refs. **DWB**—Sectional view and description of a plastic cup anemometer, provided with electric contacts and combined with wind vane. Wind speed measured with electric counter. Pointer and direction indicators of vane covered with "Scotchlite" reflective sheeting. The device, adopted for synoptic weather stations, can be easily converted into a recording apparatus. Anemometer used at the Ilmala Observatory in Helsinki for 50 years and calibrated fifty years ago with a rotational apparatus at the Central Observatory at St. Petersburg still shows the same calibration curve, according to a wind tunnel test. *Subject Headings:* **1. Anemometers 2. Wind measurement 3. Anemometer calibration 4. Finland.** —*A.A.*

5.3–80 551.508.53/4

Tsukamoto, K. and Yajima, Y., **Combination wind vane and anemometer for remote recording (Parts 1 and 2).** *Meteorological Society of Japan, Journal*, 2nd Ser., 30(11, 12):355–365, 398–402, Nov., Dec. **1952.** 16 figs., 4 tables. In Japanese; English summary p. 355–356, 398. **MH-BH**—Design, construction, installation and operation of the instrument are described in detail and illustrated in diagrams. Test results are given. The apparatus consists of cup anemometer and wind vane attached to a transmitter operated by a spring motor wound by the anemometer. Electric pulses indicating wind speed and direction are transmitted over a telephone wire. No electric energy source is required. The equipment was installed on Yakushima Island, Japan, in 1951. *Subject Headings:* **1. Remote recording instruments 2. Anemometers 3. Wind vanes 4. Wind recorders 5. Japan.**—*G.T.*

5.3–81 551.508.57

Matsuoka, Y. and Kobayashi, Y. (*Tateno, Aerol. Obs.*), **On the ground-error in Rawin observation.** *Tateno, Japan. Aerological Observatory, Journal*, 5(2):124–132, Jan. **1953.** 6 figs., refs. In Japanese; English summary p. 124. **DWB**—The double lobe system direction finder of 408 Mc is in current use in the Japanese weather service. The ground-error in the elevation angle indicated by this instrument is investigated. This error is due to ground-reflected waves. It is evaluated from the phase lag between direct and reflected waves. Results are compared with observed errors determined by simultaneous tracings of balloons by direction finder and theodolite. *Subject Headings:* **1. Rawin soundings 2. Rawin errors.**— *From authors' abstract.*

5.3–82 551.508.57

Väisälä, Vilho, **A new radio theodolite.** *Indian Academy of Sciences, Bangalore, Proceedings, Sec. A*, 37(2):223–228, Feb. **1953.** fig., 18 eqs. **DLC**—Since the Finnish (Väisälä-7) radiosonde operates on 12.5 m wave length and the antenna system must be several times the wave length, it is not possible to use a movable antenna (as with shorter wave lengths) to determine the location of the radiosonde. Instead, 2 fixed antennas are used and the direction (elevation and azimuth) of the instrument calculated by the method described. Calculating machines are recommended in place of graphical methods, and an accuracy of $\pm 0.1°$ in azimuth and of $\pm 0.1°$ at $45°$ and $\pm 0.5°$ at $12°$ elevation claimed for the first two prototypes (compared with optical theodolites). *Subject Headings:* **1. Radiosonde theodolites 2. Rawinsonde techniques 3. Väisälä radiosondes 4. Finland.**—*M.R.*

5.3–83 551.508.59:551.551

Ishida, Tamotsu and Hideo Imai, **On the anemometers used in the field investigation of fogs.** (In: Sapporo, Japan. Hokkaido University. Institute of Low Temperature Science, **Studies on fogs in relation to fog-preventing forest. 1953.** p. 137–144. 8 figs.) **MH-BH**—A detailed description, with the aid of diagrams and photographs, of a hot wire anemometer very sensitive to high frequency components of turbulent wind and capable of recording x-,

y- and z-components of wind velocity simultaneously and also of an electromechanical anemometer which has a lower sensitivity but which can discriminate between opposite wind directions. The former apparatus can record wind velocities ranging from 14–15 m/sec to 10 m/sec. The theoretical basis of the latter instrument is presented. *Subject Headings:* **1. Hot wire anemometers 2. Electromechanical anemometers 3. Turbulence measurement.** —*I.L.D.*

5.3–84 551.508.59:551.551

MacCready, Paul B., Jr., **Atmospheric turbulence measurements and analysis.** *Journal of Meteorology*, 10(5):325–337, Oct. **1953.** 10 figs., 11 refs., eqs. **MH-BH**—Describes with photographs equipment and techniques for measuring turbulence, using two hot wire anemometers and a resistance element, mounted on a post or supported by tethered balloon. Fluctuations 0–50 cycles/sec and magnitude 0.25–25 m/s can be recorded on magnetic tape and converted into pen records, samples of which are shown. The rapid methods of analysis are described and some results illustrated for probability densities, heat and momentum flux and autocorrelation. *Subject Heading:* **1. Turbulence measurement.**—*C.E.P.B.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **30-day forecasting** (Namias), 5.3–9; **Coupling between upper waves and surface pressure centers** (Matsumoto), 5.3–152; **Min. temp. forecast and fruit-frost survey** (U. S. Weather Bur.), 5.2–193; **Atmos. moisture content and precip. forecasting** (Neuwirth), 5.3–237; **Rain making** (Byers), 5.3–243.

5.3–85 551.509.2:551.582.2(4/94)

van Rooy, M. P., **Centralized hemispherical projects.** *South Africa. Weather Bureau, Notos*, 1(2):69, 78–79, **1952. DWB**—Proposes to centralize efforts for a global weather coverage under three separate projects: 1) continuation of the Northern Hemisphere Weather Map series by the U. S. Weather Bureau, 2) further developing of the Southern Hemisphere project by the Weather Bureau of South Africa and 3) establishment of a special project for the equatorial belt 30°N to 30°S. *Subject Headings:* **1. World climate coverage 2. Hemispheric weather maps.**—*A.A.*

5.3–86 551.509.2

van Rooy, M. P., **Historic weather map series for the Southern Hemisphere.** *South Africa. Weather Bureau, Notos*, 1(2):79, 84, **1952. DWB**—Note on a set of some 400 twice-daily weather maps for the Southern Hemisphere, published by the British Admiralty (*Naval Weather Service Circulars* Nrs. 13/51 and 14/51). *Subject Headings:* **1. Historical weather maps 2. Southern Hemisphere. I. Great Britain. Naval Weather Service.**—*A.A.*

5.3–87 551.509.21

Byzov, N. P., **A nyomástopográfiai térképek prognosztikai felhasználásai.** [Use of topographic pressure charts in forecasting.] *Időjárás*, 56(7/8):204–211, July/Aug. **1952.** 8 figs. Trans. from Russian (*Meteorologiia i Gidrologiia*, no. 6, **1946**) by Mrs. József Békeffy, revised and annotated by István Bodolai. **DLC**—The use of topographic pressure charts is explained by three examples on: 1) wave formation at a front situated in a well-developed convergence zone, 2) temperature convergence indicating instability of a frontal wave and 3) significance of temperature convergence and divergence in frontal analysis. *Subject Headings:* **1. Synoptic forecasting 2. Translations. I. Békeffy, Józsefné** (*trans.*) **II. Bodolai, István.**—*G.T.*

5.3–88 551.509.21:778

Canada. Meteorological Div., **Microfilming weather maps and charts.** *Canada. Meteorological Div., Cir.* 2247, G-56, Feb. 20, **1953.** 6 p. **DWB**—In connection with the weather map microfilming project initiated by the Canadian Met. Div., instructions are issued to the offices concerned regarding arrangement, tabulation, processing and storage of the material.

The program involves all maps (old and current) at all regional offices under control of the Meteorological Div. *Subject Headings:* **1. Weather map reproduction 2. Microphotographs.** —*G.T.*

5.3–89 551.509.25:551.509.317

Cena, Giuseppe, **Metodi per l'analisi e la previsione delle carte in quota.** [Methods of analysis and forecasting upper air charts.] *Rivista di Meteorologia Aeronautica*, 12(4):26–30, Oct./Dec. **1952.** In Italian; Italian, French, English and German summaries p. 26. **MH-BH**—Elements of upper air chart analysis (equations of geostrophic and gradient winds, general equations of statics, hypsometric formula, hodograph analysis) and forecasting (mechanism of pressure variations, trajectories with constant vorticity, ROSSBY's formula for the propagation of a sinusoidal wave in westerly currents) are discussed and their application to the construction of 24-hour 700, 500 and 300 mb charts is explained. *Subject Headings:* **1. Prognostic charts 2. Upper air charts 3. Synoptic analysis.**—*G.T.*

5.3–90 551.509.31:551.501.8

U. S. Bureau of Aeronautics (Navy), **Utilization of radar in short-range weather forecasting.** Project AROWA (TED-UNL-501.18), First Quarterly Progress Report, July 1, to Oct. 1, **1952** (pub. Jan. 5, 1953). 19 p. 2 figs., 2 tables, 2 refs. **DWB**—As a beginning on a project to study radar as a weather forecasting aid and to develop new forecasting techniques using radar (including prediction of rainfall intensity, the relation between visibility and rainfall intensity, squall winds, etc.), a literature search (of *MAB*) has been conducted, revealing no quantitative literature on relation between visibility and rainfall intensities. In correlations of radar echo movements with upper winds for 3 strata (2 to 20; 2 to 26 and 6–30 thousand ft) to correspond with the charts for 6,000, 10,000 and 20,000 streamline feet levels, a 1/1 correlation was not found. Tentative explanation given. *Subject Headings:* **1. Radar wind correlation 2. Short range forecast research. I. Illinois. University II. Contract N189s-88164 III. Project AROWA (TED-UNL-501.18) IV. Illinois. State Water Survey.**—*M.R.*

5.3–91 551.509.311

U. S. Air Force, **Forecasting tops of non-frontal cumulus clouds in polar air outbreaks over the North Atlantic.** *U. S. Air Weather Service, Report*, No. 971, Sept. **1945.** Later issued as *U. S. Air Force, Weather Station Technical Report*, 105-17. 44 p. 6 figs., 11 tables, 12 refs., eqs., append. **DWB**—Using values for surface temperature (forecast from a formula embracing mean monthly sea level temperature at any point of chosen trajectory from land to ship and air temperature at 5000 ft at initial point), surface pressure obtained from the appropriate sea level map and an assumed humidity of 65%, soundings were constructed on a pseudo-adiabatic diagram and height of cumulus cloud tops forecast. Tops were forecast within 1,300 ft by the method developed in this paper. *Subject Headings:* **1. Objective forecasting 2. Cloud top forecasting 3. Polar outbreaks 4. North Atlantic Ocean.**—*M.P.K.*

5.3–92 551.509.312:551.511

Bolin, Bert (*Stockholm Univ.*), **Multiple-parameter models of the atmosphere for numerical forecasting purposes.** *Tellus*, 5(2):207–218, May **1953.** 9 figs., 2 tables, 9 refs., 32 eqs. **MH-BH**—A general discussion of multiple parameter models of the atmosphere for forecasting purposes is given and various ways of arriving at such models are presented. For some two-parameter models it is possible to derive a simple graphical method of integration which may be used before high-speed electronic computors are available. A numerical example is given. Finally, the accuracy of a two-parameter representation is investigated more closely and a comparison is made with the accuracy of the radiosonde data. The conclusion is reached that a two-parameter model is adequate for representing the field of pressure-heights with an accuracy which is only slightly less than the accuracy of the radiosonde observations themselves. Hence, models of three or more parameters are of interest merely to the extent that they are capable of describing in a more satisfactory manner the processes of the atmosphere. *Subject Headings:* **1. Atmospheric models 2. Numerical forecasting techniques.**—*Author's abstract.*

5.3–93 551.509.312:681.142

"Brains" forecast weather. *Science News Letter*, 61(12):179, March 22, **1952.** fig. **DLC**—Report on the experimental use of electronic computers in preparing weather forecasts. The project is carried on by the Institute for Advanced Study, Princeton, N. J., and is based on a numerical forecasting method. By computing successive hourly forecasts the instrument works up to 24 hours. A computer under construction is hoped to accomplish this task in ½–1 hour instead of the 24 hours required by instruments used up to present. *Subject Headings:* **1. Electronic computers 2. Numerical forecasting.**—*G.T.*

5.3–94 551.509.312:681.142

Bushby, F. H. and Hinds, M. K., **Electronic computation of the field of atmospheric development.** *Meteorological Magazine*, London, 82(977):330–334, Nov. **1953.** 4 figs., 5 refs. **MH-BH**—Results of electronic computation of SUTCLIFFE's development equation (1947) at 3-hr intervals on March 14, 1949. A development chart was produced in 1 hour. From a number of other trials it was considered that useful guidance would have been given to the forecaster in 41 of 90 cases, misleading results in 13. ". . . the introduction of electronic computing machinery for the routine calculation of development charts seems somewhat premature." *Subject Headings:* **1. Electronic computers 2. Numerical forecasting.**—*C.E.P.B.*

5.3–95 551.509.312:681.142

Electronic weather forecaster. *Current Science*, Bangalore, 22(2):38, Feb. **1953. DLC**—The fastest calculating machine ever built is located at the Institute for Advanced Study, Princeton, N. J. It is nicknamed "Maniac" and has a 2000 radio tube brain specialized on weather forecasting. The equations devised for Maniac comprise the whole atmosphere up to 12 mi, in units of 240 cu miles volume. *Subject Headings:* **1. Electronic computers 2. Numerical forecasting I. Institute for Advanced Study, Princeton, N. J.**—*W.N.*

5.3–96 551.509.312:681.142

Karlqvist, Olle, **Numerical solution of elliptic difference equations by matrix methods.** *Tellus*, 4(4):374–384, Nov. **1952.** 3 figs., table, refs. p. 384. **MH-BH**—A non-iterative method for solving boundary value problems of elliptic difference equations is developed that is based on the simple structure of the triangular matrices obtained by applying the well-known elimination procedure of Gauss to the matrix of the difference equation. It is proved that the procedure is numerically stable, i.e. there is no tendency to error-growth. The method seems to be particularly suited to such problems as weather forecasting on high-speed computing machines where one has to solve the same equations (e.g., POISSON's or HELMHOLTZ's) a great number of times with the same net but different right member and boundary values. The number of stored constants as well as the computational work in the application of the method is only a fractional part of that required when using the inverse matrix (Green's function). POISSON's equation for a rectangular region is given a close study, but the method can be applied to irregular regions and to equations of higher order. *Subject Headings:* **1. Numerical forecasting 2. Electronic computers.**—*Author's abstract.*

5.3–97 551.509.312

Vernič, Rudovan, **Richardsonova numerička prognoza vremena.** [Richardson's method of numerical weather forecasting.] *Yugoslavia. Hidrometeorološka Služba. Hidrometeorološki Glasnik*, 1(2):88–98, **1948.** In Croatian. **DWB**—LEWIS F. RICHARDSON's "Weather prediction by numerical process" (Cambridge, 1922) is reviewed and criticized. It is pointed out that the method, which consists in formulating equations for certain variables and then integrating those equations, cannot take into account the actual correlation of a variable with the development of weather at a given time. It is further pointed out that by the introduction of restrictions and modifications for certain elements (some of which cannot even be numerically evaluated) the system becomes over-complicated. Several other objections are made from mathematical, physical and logical points of view, although the author states that RICHARDSON's contribution is outstanding in the field. *Subject Headings:* **1. Numerical forecasting 2. Richardson's numerical forecasting method. I. Richardson, Lewis F.**—*G.T.*

5.3–98 551.509.317

Calstead, Edward M., **A study of constant absolute vorticity trajectories on isentropic surfaces.** *Journal of Meteorology*, 10(5):356–361, Oct. **1953.** 4 figs., 13 refs., 11 eqs. **MH-BH**—For 24 and 48 hr forecasts of upper winds, constant absolute vorticity trajectories on isentropic charts give significantly better results than on constant pressure (500 mb) surfaces. A suitable form of vorticity equation is derived and the results discussed. *Subject Heading:* **1. Synoptic aerological studies.**—*C.E.P.B.*

5.3–99 551.509.317:551.501.7:551.557

Dahler, H., **Die vertikale isobare Relativbewegung, (Schichtdickenänderung) bei geostrophischer Advektion.** [The vertical isobar relative motion (change of the layer thickness) in geostrophic advection.] *Zeitschrift für Meteorologie*, 7(2):42–48, Feb. **1953.** 4 figs., 11 refs. **DWB**—A theory for the change of the thickness layer $\left(\frac{\partial H_a}{\partial t}\right)$ of the relative topography over a fixed point is developed, assuming geostrophic conditions. If the hodograph between the limiting wind vectors can be assumed as an Archimedes spiral, then the relation: $\frac{\partial H_a}{\partial t} = \pm \frac{2\omega \sin \varphi}{g} 2F$ exists, where F is the area between the hodograph and the limiting wind vectors. The author gives suggestions how to use this relationship in the daily synoptic routine. *Subject Headings:* **1. Advection 2. Hodographs 3. Upper air analysis.**—*A.A.*

5.3–100 551.509.317:517

Mason, A. H., **The construction of upper level contour charts by differential analysis methods.** *Canada. Meteorological Div., Circular* 2262, Tec. 144, March 26, **1953.** 13 p. 5 figs., table. **DWB**—Written primarily for the beginning student in meteorology, this paper deals with the rudiments of differential analysis as a means of constructing upper level charts from the sea level chart, the thermal properties of intermediate layers and data at the upper level. After defining basic concepts like isobars and contours, isobaric surfaces and layers, thickness isopleths, frontal zones and the tropopause, the author explains the construction of 1000, 850, 500 mb and higher level charts. *Subject Headings:* **1. Upper air charts 2. Upper air analysis 3. Differential kinematics.**—*G.T.*

5.3–101 551.509.317

§Ratcliffe, R. A. S., **Upper air analysis and tropical forecasting.** *Great Britain. Meteorological Office, Meteorological Report*, 2(8), **1950.** 18 p. 12 figs. **DLC**—Some of the more important ways in which upper air analysis can aid the tropical forecaster with special reference to the Indian Ocean are illustrated. Upper air charts which were constructed at Colombo in 1925 and which show: 1) "isopleths of the thickness of the 1000–500 mb layer incorporating thermal winds taken between 2000 ft and 15,000 (or 20,000) ft." and 2) "contours of the 700 mb pressure surface incorporating thermal winds and thickness lines for the 1000–700 mb layer as well as actual winds and height on the 700 mb surface" constitute the material for analysis. The contents include a general pattern of the isopleths of the thickness of the 1000–500 mb layer, the significance of the 1000–500 mb thickness pattern areas of unusually low thickness are loci of large-scale instability; association of cold pools with cold outbursts in the SW monsoon; origin of the semi-permanent low, direction and movement of the tropical storms, the uses of the contour chart with the 700 mb surface and the upper intrusion of cold air aloft. *Subject Headings:* **1. Upper air analysis 2. Upper air synoptic analysis 3. Indian Ocean.**—*I.L.D.*

5.3–102 551.509.317

Scott, J. R., **On wind analysis in low latitudes.** *Royal Meteorological Society, Quarterly Journal*, 79(342):544–545, Oct. **1953.** fig., 4 refs. **DWB**—A method of constructing upper air stream lines in regions of sparse data is described. It assumes non-divergence of the winds and gives good results. *Subject Heading:* **1. Upper air analysis.**—*C.E.P.B.*

5.3–103 551.509.317

Uwai, K. (*Centr. Met. Obs., Tokyo*), **Analysis of a cyclone in middle latitudes near Japan (I).** *Meteorological Society of Japan, Journal*, 30(10):313–328, Oct. **1952.** 12 figs., 8 refs., 9 eqs. **MH-BH**—A detailed synoptic and dynamical study of the features marking the mechanism of a cyclone in Jan. 1950 throughout its development and decay. Autograph records, synoptic surface and upper air charts, and charts showing tropopause height distribution, convergence, divergence, and movement of fronts are presented. *Subject Headings:* **1. Synoptic aerological studies 2. Cyclone structure 3. Japan.**—*G.T.*

5.3–104 551.509.5:551.576

Johnson, William R. (*USAF*), **Notes on coastal stratus in Southern California.** (1952.) 5 p. 2 figs., 3 refs. Photostat of manuscript. **DWB**—The correlation between inland pressure gradient and coastal stratus formation and the limited usefulness of such correlation in forecasting stratus are discussed. Accuracy of the method is indicated. *Subject Headings:* **1. Stratus clouds 2. Stratus forecasting 3. Southern California.**—*G.T.*

5.3–105 551.509.5:551.576

Kinzebach, R. M. (*USAF*), **Objective method of forecasting the occurrence of low clouds in the McChord-Seattle area during the summer months.** Feb. **1953.** 12 p. 2 figs., refs. Typescript. **DWB**—This paper presents an objective method of forecasting advective stratus and other low clouds during the summer months in the McChord-Seattle area. A relationship is shown between the 1630P pressure at North Bend, Oregon, and Seattle, Washington, and the inland movement of stratus and the occurrence of other low clouds. Higher 1630P pressure at North Bend, beginning at a critical positive difference, favors the occurrence of low clouds the following day; higher 1630P pressure at Seattle, at a critical negative difference, favors clear skies or fog formation, with higher values reaching 100% verification. *Subject Headings:* **1. Objective forecasting 2. Stratus forecasting 3. Washington.**—*Author's abstract.*

5.3–106 551.509.52:551.515.2(728.9)

Colón, José A. (*Univ. of Chicago*), **A study of hurricane tracks for forecasting purposes.** *Monthly Weather Review*, 81(3):53–66, March **1953.** 12 figs., 4 refs. **DWB**—A detailed statistical analysis of the formation and motion of tropical storms in the Caribbean area, with numerous charts. Annual and monthly frequencies, probabilities and regions of formation, direction and speed of motion, and persistence are considered. The study is based on data covering the period 1887–1950. *Subject Headings:* **1. Hurricane tracks 2. Hurricane forecasting 3. Statistical forecasting 4. Caribbean Sea.**—*G.T.*

5.3–107 551.509.1:551.515.4

Kirsten, M. K., **The importance of radiometeorology for weather forecasting.** *South Africa. Weather Bureau, News Letter*, No. 35:2–3, Feb. 29, **1952.** 3 figs. **DWB**—For a short time B. F. T. SCHONLAND operated 3 stations for locating thunderstorms (Johannesburg, Durban and Bulawayo, South Africa), but stations were closed because little use could be foreseen. The author suggests reestablishment of a network in South Africa for use in locating and forecasting thunderstorms for protection of aviation, etc. A chart shows frequency of thunderstorm activity in South Africa (isobronts), and another shows where sferics stations were located in South Africa and other continents, during 1947. *Subject Headings:* **1. Sferics networks 2. Radiometeorology 3. Thunderstorm frequencies 4. Sferics storm detection 5. Thunderstorm location 6. South Africa.**—*M.R.*

5.3–108 551.509.58:551.515.2

Uwai, K. (*Central Met. Obs., Tokyo*), **Tropopause wave and typhoon (I).** *Geophysical Magazine*, Tokyo, 23(4):309–328, May **1952.** 22 figs., 20 refs., 10 eqs. **MH-BH**—The author develops a limited method for forecasting the path of a typhoon based upon the fact that the typhoon moves in a tropopause trough, enters the region of interference between two tropopause troughs which lie in temperate westerlies and which accompany the belt of jet stream, and then decays rapidly over Japan. The tropopause analysis is based upon aero-

logical data for the 300 mb surface, the isopleth of temperature distribution with height above the 300 mb surface and the topographic change of isobaric surface. The method is useful for the period in which the westerly trough moves far eastward and is not present during the summer over southern Honshu. When the westerly trough becomes conspicuous and moves southward covering all Japan the easterly trough moves south of Japan. *Subject Headings:* **1. Typhoon track forecasting 2. Tropopause trough 3. Japan.**—*I.L.D.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

STRUCTURE OF THE ATMOSPHERE

See also: **Study of ionospheric D region** (Gardner, Pawsey), 5.3–37; **Atmospherics with very low frequency components** (Hepburn, Pierce), 38; **Travelling disturbances in ionosphere** (Samayajulu, Rao, B. and Rao, E.), 5.3–39; **Temp. discontinuities in stratosphere** (Scherhag), 5.3–200; **London fog, Dec. 5–8, 1952** (Bonacina), 5.3–250.

5.3–109 551.510:551.521.3

Chapman, Sydney, **Note on the grazing-incidence integral Ch (x, χ) for monochromatic absorption in an exponential atmosphere.** *Physical Society of London, Proceedings, Ser. B,* 66(404):710–712, Aug. **1953.** table, 2 refs., 6 eqs. **DLC**—Author gives notes and improvements on his earlier work (1931) on absorption of monochromatic solar radiation. A table is given for a new variable $\Delta\chi$ defined by Ch (x, χ)=sec $(\chi-\Delta\chi)$, useful for radio science. *Subject Heading:* **1. Atmospheric absorption.**—*C.E.P.B.*

5.3–110 551.510.3

Alaska. University. Geophysical Institute, **Searchlight technique for exploring the atmosphere.** Contract AF 19(604)-108, Final Report, Nov. 1, 1951 to Oct. 31, **1952.** 6 p. graphs, diagrs., refs. **DWB**—The measurement of the density of the atmosphere by the searchlight technique has been investigated. With the present apparatus, useful measurements are limited to approximately 45 km, due to the noise introduced by the background light from the night sky. It is shown that a significant improvement in the results can be made only by increasing the intensity of the searchlight beams. A method for decreasing the effect of the background noise is discussed. *Subject Headings:* **1. Searchlight technique 2. Air density. I. Contract AF 19(604)-108.**—*Author's abstract.*

5.3–111 551.510.3:551.508:35

Colvin, Henry F., III. (*Kollsman Instrument Corp., N. Y.*), **Measuring air-density for aircraft gunnery computers.** *Tele-Tech,* New York, 12(9):68–70, Sept. **1953.** 3 figs., 17 eqs. **DWB**—In aerial gunnery, knowledge of the density of the air through which the guns must fire is of prime importance in securing accurate results. The relative air density system engineered by Kollsman is designed to provide these data for use in gunnery computers. Temperature, measured by variable resistance bulb, is combined with pressure information to compute relative air density. Special low-friction synchro is employed to translate RAD information into shaft rotation. *Subject Headings:* **1. Air density measurement 2. Military meteorology.**—*Quoted from paper.*

5.3–112 551.510.3:551.501.45

*Rickwood, G. E., **Tables of the relative density of humid air.** *National Research Council of Canada, Report* No. MA-207. Ottawa, July 19, **1948.** 33 p. mostly tables. **DWB**—Elaborate tables showing the ratio of the density of air under various temperatures, pressures and humidities to that of dry air at 15°C and pressure of 29.921, and for temperatures of 10°–40°C at 1°C intervals and for pressures from 28–31 inches at intervals of 0.1 inch. The tables are intended for computing true air speed in pitot tubes. *Subject Headings:* **1. Air density 2. Computation tables 3. Pitot tubes. I. National Research Laboratories [Canada].**—*M.R.*

5.3–113 551.510.42:546.22

Jacobs, Morris B. (*Dept. of Health, N. Y. City*), **Methods for the differentiation of sulfur-bearing components of air contaminants.** U. S. Technical Conference on Air Pollution, Wash., D. C., Air Pollution, 1950. p. 201–209. refs. **DLC**—Special consideration is given in this paper to the detection and evaluation of the atmospheric concentration of the peroxydisulfates, carbon oxysulfides and various organic sulfides, thiols and persulfates. Methods of sampling and analysis of these various contaminants are described. *Subject Headings:* **1. Air sampling and analysis 2. Chemical analysis of air 3. Atmospheric contaminants 4. Sulphur.**—*I.L.D.*

5.3–114 551.510.42:551.508.91

†Kay, Kingsley (*Dept. of Natl. Health and Welfare, Ottawa*), **Analytical methods used in air pollution study.** *Industrial and Engineering Chemistry*, 44(6):1383–1388, June 1952. 102 refs. **DLC**—Methods and techniques recently developed for aerosol collection, analysis of collected aerosols, direct analysis of aerosols and analysis of gas and vapor pollutants are reviewed. Among the new methods used, the increasing application of the electron microscope, infrared and mass spectrometer methods, low temperature collection procedures and a stronger emphasis on laboratory studies are pointed out as marking the path of present and future development in air pollution study. *Subject Headings:* **1. Aerosol measurement 2. Air sampling and analysis.**—*G.T.*

5.3–115 551.510.4:536.7

*Mori, Yasuo (*Lab. of Oxygen Pilot Plant, Sc. Res. Inst., Tokyo*), **On a chart of air at low temperatures and low pressures.** *Tokyo. Scientific Research Institute, Journal*, 46(1,276):68–105, June 1952. 8 figs., 19 tables, refs., 21 eqs. **DLC**—New equation of state proposed based on investigation of experimental data (density, enthalpy, isentropic work, sound velocity and specific heat capacity). Detailed tables give these characteristic values computed from the equation. Scattering of experimental data from curve 0.5%. Temperature range from 83 to 375°K. The paper presents a concentrated source of information for meteorologists, although the study originally was made for air separation plants. *Subject Headings:* **1. Equation of state 2. Air properties 3. Air separation.**—*A.A.*

5.3–116 551.510.42

Kehoe, Robert A. (*Kettering Lab. of Applied Physiology, Univ. of Cincinnati*), **Effects of prolonged exposure to air pollutants.** U. S. Technical Conference on Air Pollution, Wash., D. C., 1950, Air Pollution, 1950. p. 474–478. **DLC**—The factors that must be considered in the etiologic analysis of air pollution, including air pollution of natural origin and of artificial origin and topographical and meteorological factors, are reviewed briefly. Also the diurnal effects of air pollutants, the methods of study pertinent to the problems of community air pollution are considered. *Subject Heading:* **1. Atmospheric pollution.**—*I.L.D.*

5.3–117 551.510.42:551.594.13

Kulagin, D. I., **Vliianie zapylennosti vozdukha na elektricheskoe sostoianie atmosfery.** [The effect of the dust in the air on the electrical condition of the atmosphere.] *Tashkent. Geofizicheskaia Observatoriia, Trudy*, 4(5):71–76, 1950. 2 figs., 4 tables, 10 refs. **DLC**—Observations of dust content of the air made at 7h each day in 1948 at Tashkent Geophysical Observatory are analyzed and compared with observations of electric conductivity and potential gradient in order to determine the relation between number and size of condensation nuclei and the electric state of the atmosphere in different seasons. At Tashkent there is a winter maximum and summer minimum of dust content. Data for Kew and Watheroo (Australia) show a similar winter maximum of condensation nuclei and conductivity though climatic conditions differ remarkably from Tashkent, which is on the eastern edge of a desert. The relation between the electric conductivity and number of condensation nuclei is not as simple as might be suspected from the seasonal variation in number of condensation nuclei. The conclusion is that the size of the condensation nuclei, and hence the conductivity of the air, increases with increasing humidity. Hence, although the number of nuclei is at a maximum in winter at Tashkent, the relative humidity is at a minimum in the summer so the conductivity

may be low at both seasons and high in the more humid spring and fall. *Subject Headings:* **1. Dust content of air 2. Condensation nuclei 3. Electrical conductivity of air 4. Tashkent, U.S.S.R.**—*M.R.*

5.3–118 551.510.42:551.574.1

Yano, T. and Okamoto, M. (*Met. Res. Inst., Tokyo*), **On the structure of dust-free space and its application.** *Geophysical Magazine*, Tokyo, 23(4):409–414, May **1952.** 5 figs., table, 9 refs., 8 eqs. **MH-BH**—Experimental studies of dust free space carried out by WATSON, MIYAKE and CAWOOD is reviewed in detail; the experimental procedures for obtaining dust free space are described with the aid of diagrams of the apparatus, which were thermal precipitators, and the empirical equations for determining the thickness of the dust free space are presented. Experimental procedure and apparatus employed by the authors to measure directly with a microscope the thickness of dust free space are described. The results of measurements indicate that the thickness of dust free space increases with increasing air flow even at the same temperature. On the basis of the assumption that the cause of dust free space is a differential molecular bombardment on the particles in the steep and varying temperature gradient near the hot body, a theoretical equation for determining the thickness of dust free space is derived. *Subject Headings:* **1. Dust free spaces 2. Experimental meteorology.**—*I.L.D.*

5.3–119 551.510.42:016

†London. Science Museum. Science Library, **Particle counting and analysis.** *London. Science Museum. Science Library, Bibliographical Series*, No. 719, [1953?] 5 p. Mimeo. **MH-BH**—About 100 unannotated references to articles or works on various aspects of micromeritics. Dust or aerosol counting instruments, techniques and statistical methods of computing the data figure heavily in the literature. Material is arranged chronologically from 1923 to 1953. *Subject Headings:* **1. Micromeritics bibliographies 2. Dust counting techniques 3. Aerosol measurement.**—*M.R.*

UPPER ATMOSPHERE—IONOSPHERE

5.3–120 551.510.5:551.521.3:523

Aller, L. H., Wilkinson, John K., Henize, Karl G. and Mitchell, Walter (*Michigan Univ. Obs.*), **The radiation flux of a helium atmosphere.** *Astronomical Society of the Pacific, Publications*, San Francisco, 64(380):262–264, Oct. **1952.** fig., 10 refs. **DLC**—Model hydrogen and helium atmosphere studied with a temperature of 2700K° and an effective surface gravity 1.6×10^4 dynes. Deviation from black body radiation shown. *Subject Headings:* **1. Stellar atmospheres 2. Radiation flux 3. Helium atmospheres.**—*A.A.*

5.3–121 551.510.5

Harvard College Observatory. Rocket Panel, **Pressures, densities, and temperatures in the upper atmosphere.** *Physical Review*, 88(5):1027–1032, Dec. 1, **1952.** 3 figs., 3 tables. **DWB**—Smoothed curves of pressure, density and temperature from 0 to 220 km from results of 68 V-2, 63 Aerobee and 7 Martin Viking rocket ascents at White Sands, N. Mexico. The panel is not so foolish as to call this a standard atmosphere, but merely the combined results of numerous investigations as of Jan. 1952. Temperature calculations by many groups are tabulated and the weighted means and adopted values shown. Below 30 km values are obtained from radiosonde ascents at White Sands. No correlation has been made for dissociation of O_2>80 km, nor for seasonal effects, daylight effects or instrumental errors (the latter may be greater than real variations). Other soundings with rockets (on the equator) or by meteors and acoustical means in the Arctic (Fairbanks) and Tropics are related to these data. The whole matter is still pending. *Subject Headings:* **1. Upper atmosphere structure 2. Upper atmosphere models 3. Rocket data 4. White Sands, New Mexico.**—*M.R.*

5.3–122 551.510.53:523.38

Paetzold, H. K., **Über die visuelle Erdschattengrenze bei Mondfinsternissen.** [On the visual edge of the earth shadow in lunar eclipses.] *Zeitschrift für Astrophysik*, 32(4):303–310,

1953. 4 figs., table, 19 refs. **DLC**—Owing to the earth's atmosphere, the edge of the shadow is not a sharp line. Author experimented with a matt screen seen past a rotating sector cut to represent the theoretical brightness of the atmosphere. The measured positions of the shadow edge were greater than the true diameter of the shadow by 1.6 to 3%. Results led to assumption of an absorbing layer at a height of about 90 km. *Subject Headings:* **1. Structure of the stratosphere 2. Lunar eclipses.**—*C.E.P.B.*

5.3–123 551.510.53:551.507.362

†Temple Univ. Research Institute, **Research in the physical properties of the upper atmosphere with V-2 rockets.** Contract W19-122-AC-12, Final Report, April 1, 1948 to Feb. 29, 1952, Aug. 20, **1952.** 101 p. 31 figs., eqs., 148 refs. on humidity measurements, p. 31–39; 26 general refs., p. 98–99; 43 refs. on acoustics, p. 99–101. **DWB**—This report covers work completed during the past four years. In particular it includes work on ion clusters, statistical fluctuation of density at a given point in a gas, and the fall of a warhead with a parachute from high altitude. These are theoretical considerations and the original reports should be read for details since only the results can be given here.—It also includes work on the measurement of absorption coefficients of air at low pressures and at various frequencies. This gives results that fall below the classical at low pressures and are believed to be due to the effective viscosity coefficient. Experimental curves and theoretical considerations are given.—Sample calibration curves for microphones and of the anechoic chamber are included as well as photographs and descriptions of various pieces of apparatus such as wind tunnel, ultrasonic wave analyzer, pulser, apparatus installed in Blossom IV–G, automatic feed wire exploder, etc.—Results on measurements of noise on the skin of the missile and on meteoritic impacts on the noise obtained during V-2 flights are given.—Various sources of rather intense sound were investigated as to their suitability for high altitude work, including spark gaps, explosives (primers) and exploding wires.—Transient responses of microphones and velocity of sound in tubes and at various pressures were investigated. *Subject Headings:* **1. Upper atmosphere research 2. Rocket instrumentation 3. Rocket soundings. I. Bohn, J. Lloyd II. Nadig, Francis H. III. Contract W19-122-AC-12.**—*Author's abstract.*

5.3–124 551.510.534

Rochester Univ. Institute of Optics, **Vertical distribution of atmospheric ozone, Project Skyhook.** Contract N6onr 241, T.O. (03), Project NR 082-055, Final Report, June **1953.** 15 p. 11 figs., 2 tables, 15 refs. **DWB**—Report on the determination of ozone above certain heights up to 30.5 km made by means of spectrophotographs from a balloon. The results show a remarkable similarity to measurements made by O'BRIEN in 1935, but do not agree with data published by REGENER (1934). The new data give a more definite maximum at 27.5 km. *Subject Headings:* **1. Vertical ozone distribution 2. Spectrophotographs. I. Contract N6onr 241 T.O. (03).**—*A.A.*

5.3–125 551.510.535:621.396

Appleton, Sir Edward and Beynon, W. J. G., **Radiocommunication on frequencies exceeding predicted values.** *Institution of Electrical Engineers, Proceedings*, 100, Pt. III (66):192–198, July **1953.** 8 figs., 4 tables, 10 refs., 5 eqs. **DWB**—Receipt of Daventry short-wave signals at Gibraltar and Algiers shows that communication is often established on frequencies higher than predicted maximum usable frequencies. Examination shows that during winter and equinoxes noon anomalies are often due to variability in characteristics of the F2 region. In summer the abnormal E region provides copious reflection at oblique incidence. In Japan observations on 30 Mc/s show that transmissions on frequencies above F2 m.u.f.s. are due to abnormal E region. *Subject Headings:* **1. Ionospheric variations 2. Radio wave propagation.**—*C.E.P.B.*

5.3–126 551.510.535:621.396.029

Bolle, A. and Dominici, P., **Contributo al calcolo dell assorbimento nella propagazione ionosferica delle onde corte.** [Contribution to the calculation of the absorption of the ionospheric propagation of short wave.] *Annali di Geofisica*, 5(3):377–396, July **1952.** 2 figs.,

7 refs., 39 eqs. English summary p. 396. **MH-BH**—The value for the coefficient of atmospheric attenuation for short waves, the absorption applying to the various ionospheric layers and to the various models of propagation of the waves have been calculated. *Subject Headings:* **1. Ionospheric structure 2. Radio wave propagation 3. Short waves.**—*From authors' abstract.*

5.3–127 551.510.535:551.524.7

†Gerson, Nathaniel C., **Kriticheskiĭ obzor dannykh o temperature ionosfery.** [A critical review of data on ionospheric temperatures.] *Uspekhi Fizicheskikh Nauk*, Moscow, 47(4): 561–624, Aug. **1952.** 18 figs., 10 tables, bibliog. p. 619–624, eqs. **DLC**—Russian trans. of paper published in *Reports on Progress in Physics*, 14:316–365, **1951** (*see item* 3.4–100, April 1953, *MAB*). The translator gives critical remarks or suggestions as well as references to additional Russian literature on this subject. *Subject Headings:* **1. Temperature of the ionosphere 2. Reviews 3. Translations.**—*A.A.*

5.3–128 551.510.535:551.524.7

Gerson, Nathaniel C. (*Air Force Cambridge Res. Lab., Mass.*), **Ionospheric temperatures.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept. 1950, Proceedings*, **1951.** p. 95–99. table, 6 refs., 4 eqs. **DWB**—The theory which enables calculations of magnitude of collisional frequencies and hence ionospheric lapse rates and temperatures from radio ionospheric data is clearly explained. A temperature increase which yields observed collisional frequencies, was found to be 10°K per km in the region from 100 km to 400 km. Resulting temperatures are calculated to be 300, 800, 1300, 1800, 2300, 2800 and 3300°K at 100, 150, 200, 250, 300, 350 and 400 km respectively. These values are higher than previous models have indicated. It is expected that the temperature starts dropping at a height somewhat above 400 km. *Subject Headings:* **1. Temperature of the ionosphere 2. Ionospheric lapse rates 3. Collisional frequencies.**—*M.R.*

5.3–129 551.510.535

Great Britain. Dept. of Scientific and Industrial Research. Radio Research Board, **Characteristics of the ionosphere observed in Great Britain 1930–1946. Measurements made at the Radio Research Station, Slough, England, 1930–1946 and at Burghead, Scotland 1941–1946.** Its *Special Report*, No. 23, **1953.** VI+16 p. 9 figs., tables, 21 refs. **DLC, GB-MO**—The introduction gives a history of the methods of ionosphere investigation—critical frequency, pulse method, etc. In Pt. 2 the observations at Slough and at Burghead Scotland, are described. Appendixes define units and symbols and list the hourly measurements; microfilm or enlarged copies can be bought. *Subject Headings:* **1. Ionospheric research 2. Slough, England.**—*C.E.P.B.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Cyclone dynamics** (Raethjen), 5.3–10; **Eddy diffusion of momentum** (Rider), 5.3–11; **Multiple-parameter models of atmos. for numerical forecasting** (Bolin), 5.3–92.

5.3–130 551.511(09)

Albert, László, **Szemelvények a dinamikus meteorológia fejlődéstörténetéből.** [Review of progress in dynamic meteorology.] *Időjárás*, 56(1/4):43–49, Jan./April **1952.** 6 refs. Russian and French summaries p. 123. **DLC**—The author gives an outline of dynamic meteorology since V. Bjerknes laid its foundations in 1904. Development of upper air analysis, the barotropic model, the baroclinic theory and the general circulation theory are discussed. The author believes that advective dynamic theory (as developed by the Soviet scientists Pogosian and Taborovskiĭ) will soon provide a means of preparing fairly accurate extended forecasts. *Subject Headings:* **1. Dynamic meteorology 2. Progress in meteorology.**—*G.T.*

5.3–131 551.511

Arakawa, Hidetoshi (*Met. Res. Inst., Tokyo*), **On solution of the GRIMES type in spherical polar coordinates and cylindrical coordinates.** *Papers in Meteorology and Geophysics*, Tokyo,

3(1):19–25, March **1952.** 2 figs., 3 refs., 26 eqs. **MH-BH**—The mathematical analysis given in this paper is based on the equations of steady, frictionless motion derived by A. GRIMES and modified by A. F. CROSSLEY. The author identifies the close connection between these formulas and the expression representing the law of conservation of angular momentum. *Subject Headings:* **1. Equations of motion 2. Angular momentum.**—*G.T.*

5.3–132 551.511:551.513

Arakawa, H., **On the time rate of work done by the eddy stresses in the free air, and the maintenance of westerlies in middle latitudes.** *Journal of Meteorology*, 10(5):392–393, Oct. **1953.** table, 7 refs., eq. **MH-BH**—Time rates of work by eddy flow and dissipation of kinetic energy by internal molecular viscosity are calculated from upper air data for levels 2000–55,000 ft in 31°N and 13°N. The integrals are -5.2×10^{2} and 6.3×10^{-9} g/sec^3. These results are discussed. *Subject Headings:* **1. Energy dissipation 2. Zonal circulation.**—*C.E.P.B.*

5.3–133 551.511

Giraud, P. and Kiveliovitch, M., **Quelques remarques sur les invariants en météorologie.** [Some remarks on invariants in meteorology.] *Journal Scientifique de la Météorologie*, 4(15):81–86, July/Sept. **1952.** 3 refs., eqs. English and Spanish summaries p. 81. Also *ibid.*, 5(19):127–128, July/Sept. **1953.** eqs. **DWB—1)** Using EULER's equation of movements for a nonviscous barotropic fluid, the authors show that the expression: $\frac{d}{dt}\left[\frac{\vec{\Gamma}_a}{\rho}(\vec{V}_a-\text{grad } W)\right]$ assumed to be zero by ERTEL and ROSSBY (see *Geophysica Pura e Applicata*, 14:189–193, April/June, 1949) is actually variable and equal to $\frac{\vec{\Gamma}_a}{\rho}(\vec{\Omega}\Lambda\vec{V})$; $\frac{d}{dt}$—is the differentiation following the motion of the fluid. $\vec{\Gamma}_a$—absolute vorticity, $\vec{V}_a$—absolute velocity, grad W is the gradient of the action $\frac{dW}{dt}=L$, $L=\frac{1}{2}V^2+\vec{\Omega}\cdot\vec{D}_\Omega-\left(\Phi+\int\frac{dp}{\rho}\right)$; V—relative velocity, $\vec{\Omega}$—vector of the earth's rotation; $\vec{D}_\Omega=\vec{r}\Lambda\vec{V}$ is the momentum of the particle in regard to the earth's center; Φ—gravity potential, p and ρ—the pressure and density of the air. 2) Authors call attention to a serious error in the previous article where equations 5, 6, 7 and 8 were based on relative and not absolute axes. Necessary corrections are indicated in detail. *Subject Headings:* **1. Vorticity theory. I. Ertel, H. II. Rossby, C.**—*A.A.*

5.3–134 551.511

Grant, Alison M., **The effect of the steady-state assumption on constant vorticity trajectories.** *Journal of Meteorology*, 10(5):397–398, Oct. **1953.** fig., 4 refs., 10 eqs. **MH-BH**—Constant absolute vorticity (C A V) trajectories are compared with true trajectories and some considerable errors found. *Subject Heading:* **1. Vorticity equations.**—*C.E.P.B.*

5.3–135 551.511

James, R. W., **The earth's angular momentum balance: a nonsense problem?** *Journal of Meteorology*, 10(5):393–397, Oct. **1953.** figs., 4 refs. **MH-BH**—Theories of the balancing of angular momentum in the earth's atmosphere by sources and sinks are discussed and the difficulties pointed out. *Subject Heading:* **1. Mechanics of the atmosphere.**—*C.E.P.B.*

5.3–136 551.511:551.551:533.6

†Krzywoblocki, M. Z. (*Illinois Univ.*) **On the fundamentals of the boundary layer theory.** *Franklin Institute, Philadelphia, Journal*, 255(4):289–299, April **1953.** 39 refs., eqs. **DWB**—A literature review, emphasizing the strictly mathematical problem, rather than numerous "engineering solutions." The existence and uniqueness theorems are outlined, as well as equations governing the velocity, temperature and density distribution in the boundary layer. The conclusion is reached that the existence theorem could be derived by the available methods of mathematics, but the strict solution of other problems is still extremely difficult,

when numerous trial computations are made by means of high-speed computing devices. *Subject Headings:* **1. Boundary layer 2. Turbulence theory 3. Boundary layer theory.**—*A.A.*

5.3–137 551.511

Railston, W., **The temperature decay law of a naturally convected air stream with distance from its source of heat.** *Great Britain. Meteorological Research Committee, M.R.P.* 818, May 30, **1953.** 10 p. 8 figs., 4 tables, 7 refs. Mimeo. Also in: *Physical Society of London, Proceedings, Sec. B,* 67(1):42–51, Jan. 1, **1954. DWB**—In air rising from an electrically heated $3\frac{1}{2}$ cm gauze square, temperatures were measured by thermistor at points 5–70 cm above gauze. Rising air stream was observed by a very sensitive Schlieren system to exclude draughts. Mean temperature distribution across rising jet, corrected for radiation, was represented by: $91.3\ Q^{0.675}Z_o^{-1.52}$; where Q = heat output in watts and Z_o = height above theoretical equivalent point source. An expression was also derived for width of rising jet. Both these agreed closely with theoretical formulas due to O. G. Sutton. *Subject Heading:* **1. Convective currents.**—*C.E.P.B.*

5.3–138 551.511:551.515.827

Reed, Richard J. and Sanders, Frederick, **An investigation of the development of a mid-tropospheric frontal zone and its associated vorticity field.** *Journal of Meteorology,* 10(5):338–349, Oct. **1953.** 11 figs., 2 tables, 11 refs., 25 eqs. **MH-BH**—An example of intense frontogenesis at 500 mb over U.S.A. on Jan. 27–28, 1953 is presented and the underlying mechanism is investigated both from thermal and dynamic standpoints. It is shown that the basic process is a cross stream gradient of sinking motion with strongest subsidence at the warm edge of the frontal zone. This gives rise to an intensified horizontal temperature gradient and because of the "vertical-shear" terms in the vorticity equation, leads to a marked increase in vorticity. The Ertel vorticity theorem is employed to confirm these conclusions and to show that in certain regions the frontal zone was of stratospheric origin. It is shown how the vertical shear terms may be incorporated in the Sawayer-Bushby numerical prediction mode *Subject Heading:* **1. Frontal development.**—*From author's abstract.*

5.3–139 551.511

Smebye, Sigurd J. (*Stockholm Univ. and Det Norske Met. Inst.*), **Tendency computations with a continuous two-parametric atmospheric model.** *Tellus,* 5(2):219–223, May **1953.** 6 figs., refs. **MH-BH**—In a case of strong development the tendencies at the 500 and 1000 mb surfaces are computed with a two parametric model. It is possible to take the thermal structure of the atmosphere into account in a crude manner by expressing the vertical temperature distribution as a function of the deviation of the 1,000–500 mb thickness from a standard value. The height of the 500 mb surface and the 1,000–500 mb thickness are used as variables. The tendencies are computed for two maps 12 hrs apart, the intermediate tendencies interpolated for every 2 hrs and the 12 hr change of the 1000 and 500 mb surfaces are then computed. The tendencies computed represent an improvement over those computed with the barotropic model, but the 12 hr changes are still only about $\frac{2}{3}$ of the observed changes. *Subject Headings:* **1. Atmospheric models 2. Thermodynamics of the atmosphere.**—*Author's abstract.*

5.3–140 551.511:551.515.23

Syōno, S. (*Univ. Tokyo*), **On the motion of a vortex in a non-uniform pressure field.** *Papers in Meteorology and Geophysics,* 2(2):117–128, June **1951.** 6 figs., 4 refs., 65 eqs. **MH-BH**—In this paper, equations of a vortex in a non-uniform pressure field are obtained. Integrating the equations of motion over the domain of a vortex and separating the motion into that of a vortex as a whole and that within the vortex, equations of motion of a vortex are obtained. Among other things, important results obtained are as follows: (1) By the effect of the Rossby force and the Coriolis force, the vortex moves on a cycloidal path, a cyclonic vortex eastward and an anticyclonic westward. (2) The motion of a vortex in a uniform pressure gradient field is composed of four types of motion. (3) The well-known fact that cyclones tend to isallobaric lows is explained. *Subject Headings:* **1. Vortexes 2. Vortex movement.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Cyclone dynamics** (Raethjen), 5.3–10.

5.3–141 551.513:551.555.1

†Flohn, Hermann, **Wilhelm Meinardus und die Revision unserer Vorstellungen von der atmosphärischen Zirkulation.** [Wilhelm Meinardus and the revision of our concepts of the atmospheric circulation.] *Zeitschrift für Meteorologie*, 7(4):97–108, April **1953.** 3 figs., 5 tables, 47 refs. **MH-BH**—A historical sketch of the development of MEINARDUS' concept of the general atmospheric circulation in particular in tropical latitudes based upon discovery in 1894 of an equatorial west wind zone and of its relationship to the monsoonal circulations is discussed in the light of recent studies on the general circulation. The seasonal wind variations of the monsoon are the result of the seasonal displacement of the planetary atmospheric pressure and wind belts in continentally dominated regions. The components associated with easterly (equatorwards) flow are trade winds, while those with westerly flow (poleward) are monsoons. And westerly flow prevailing throughout the year constitutes equatorial west winds. *Subject Headings:* **1. Atmospheric circulation 2. Equatorial westerlies 3. Monsoon circulation 4. Tropical meteorology.**—*I.L.D.*

5.3–142 551.513:523.45:523.746

Shapiro, Ralph, **A planetary-atmospheric response to solar activity.** *Journal of Meteorology*, 10(5):350–355, Oct. **1953.** fig., 4 tables, 6 refs. **MH-BH**—From a series of photometric measurements on photographs of Jupiter's visible surface, a close relation was found between Jupiter's albedo and relative sunspot numbers. For the whole disc correlation was 0.91, increasing from 0.5–0.6 near equator to 0.75–0.8 in lat. 60°N. and S. The cause of the relation is obscure; it is tentatively attributed to trigger effects of sun's ultraviolet radiation on height variations of the clouds of crystalline ammonia forming Jupiter's atmosphere. *Subject Headings:* **1. Planetary circulation 2. Jupiter 3. Sunspot effects.**—*C.E.P.B.*

5.3–143 551.513.2:551.557

†Murray, R., **The upper troposphere and lower stratosphere near jet streams: an examination of observations made by the Meteorological Research Flight, Farnborough.** *Great Britain. Meteorological Research Committee, M.R.P.* 813, May 21, **1953.** 18 p. 17 figs., 3 tables, 9 refs. Mimeo. **GB-MO**—From 20 special flights near jet stream and synoptic studies it is found that: 1) mean temperature gradient was 3°F/100 naut. mi and structure agreed with that normally given by vertical sections. 2) Frost point was variable; average R.H. at jet stream level was 50% 300 mi to right of axis (looking downwind) and 10% 300 mi to left. 3) Layer cloud occurred to right of axis but not to left or above, consistent with ascent in troposphere on high pressure side and descent on low pressure side. 4) Tropopause on low pressure side is sometimes disrupted. Occurrence of clear air turbulence is also discussed. *Subject Headings:* **1. Jet stream 2. Great Britain.**—*C.E.P.B.*

ATMOSPHERIC DISTURBANCES

See also: **Airborne radar,** 5.3–35; **Study of hurricane tracks for forecasting** (Colón), 5.3–106; **Importance of radiomet. for forecasting** (Kirsten), 5.3–107; **Development of mid-tropospheric frontal zone, its vorticity field** (Reed, Sanders), 5.3–138; **Vortex motion in non-uniform pressure field** (Syōno), 5.3–140; **Barograph antics** (Williams), 5.3–209; **Storm tide, Feb. 1, 1953** (Sneyers), 5.3–218; **Unusual CuNb cloud** (Day), 5.3–229; **Five flights through thunderstorm belt** (Jones), 5.3–232; **Cloud in relation to active warm fronts** (Sawyer, Dinsdale), 5.3–255; **Electric field in thundercloud** (Uchikawa, Ogino), 5.3–321.

5.3–144 551.515.1(54):551.553.21

†Desai, B. N., **On the development and structure of monsoon depressions in India.** *India. Meteorological Dept., Memoirs*, 28(5):217–228, **1951.** 24 figs., 10 refs. **DWB**—Analysis of

radiosonde ascents and surface, 850, 700 and 500 mb charts for 8–13th of July 1947 gives an insight into the circulation, air mass and orographic conditions which result in monsoon rainfall. Depressions form on the North Bay of Bengal at the southeastern end of the seasonal trough of low pressure, when fresh cold SW or W monsoon air from the South Indian Ocean extends northward into the Bay of Bengal and is deflected NW by the various ranges and the seasonal low. The belt of rain forms after the cold monsoon current weakens. One warm front separation is usually found between cold SW to W air mass and these warm easterly masses at high levels (from the Pacific). *Subject Headings:* **1. Monsoon rains 2. Structure of monsoon depressions 3. Synoptic studies 4. India 5. Bay of Bengal.**—*M.R.*

5.3–145 551.515.1(73):551.577.2

*†Schulte-Vennbur, Hermann, **Die Struktur von Niederschlagsgebieten nordamerikanischer Zyklonen.** [Structure of the precipitation areas of North American cyclones.] Thesis (*Ph.D.*)—Rheinische Friedrich Wilhelm-Universität, Bonn, [1952?] 64 p. 19 figs., map (fold.), 7 tables, 109 refs. Mimeo. **DWB**—Study based on hourly precipitation amounts measured at 1500 stations, scattered all over the U. S., during 32 cyclones in 1949 and 1950. Usually the greatest precipitation area and intensity lie on the left of the track of the cyclonic center. No direct connection could be found between the fronts and the main precipitation area. An attempt is made to explain the observed characteristic features by upslide processes and waves within the boundary surface of the air masses. The distribution of precipitation is illustrated by means of precipitation-time diagrams for selected cross sections. *Subject Headings:* **1. Precipitation distribution 2. Cyclonic precipitation 3. United States.**—*A.A.*

5.3–146 551.515.1(71)

Stark, R. G., **November storms in Newfoundland.** *Weather*, 8(11):330, Nov. **1953.** 2 photos. **MH-BH**—Three storms moved up from the south in Nov. 1952, the most destructive for many years, on Nov. 5–6, 12–13 and 17–18. On the 13th several feet of snow fell; photos show drifts in Gander Airport. The storms were followed by extensive fog. *Subject Headings:* **1. Barometric depressions 2. Newfoundland.**—*C.E.P.B.*

5.3–147 551.515.1(262)

§Gleeson, Thomas A., **Cyclogenesis in the Mediterranean region.** Florida. State University. Dept. of Meteorology, Contract AF 19(122)-466, Scientific Report No. 1 (with separate appendix), Dec. 15, **1952.** 56 p. 33 figs., 8 refs. **DWB**—The first in a series of reports dealing with climate and weather in the Mediterranean region. The surface characteristics of cyclogenesis, statistically summarized by the author, deal with the types, origin and frequency of cyclones, their movement and deepening. A discussion of the upper air conditions includes the mean synoptic conditions for cyclogenesis (surface, isobars and isotherms), isobar direction at 3 km and cyclone trajectories, temperature change at 500 mb and the relation of vertical temperature distribution and of 500 mb temperature to the central pressure of the cyclone. Study is limited to the months Oct. to May, when cyclogenesis is most frequent. Charts presenting the bimonthly frequency of cyclogenesis show the Italian area as the main place of origin. A secondary place is Algiers in the springtime. *Subject Headings:* **1. Cyclogenesis 2. Mediterranean region 3. Italy. I. Florida. State University Dept. of Meteorology II. Contact AF 19(122)-466.**—*A.A.*

5.3–148 551.515.11

Kasahara, A. (*Geophys. Inst., Tokyo Obs.*), **The structure of a tropical cyclone in the incipient stage.** *Geophysical Magazine*, Tokyo, 24(2):129–154, Nov. **1952.** 7 figs., ref., eqs. **MH-BH**—The difference and the relation between the parcel and perturbation methods of deriving the instability criterion of a tropical cyclone in a latent unstable atmosphere are discussed. It is shown that the important role of the scale effect can be expressed by the perturbation method only. Along the lines of SYŌNO's theoretical treatment of the formation and development of a tropical cyclone, the author presents the dynamical structure of a tropical

cyclone in an incipient stage by solving perturbation equations concerning the perturbed pressure under appropriate boundary and initial conditions. *Subject Headings:* **1. Cyclone structure 2. Cyclone dynamics 3. Cyclogenesis.**—*From author's abstract.*

5.3–149 551.515.11 551.515.711

†Khromov, S. P., **O sovremennykh teoriiakh tsikonoobrazovaniia.** [On current theories on cyclone formation.] *Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia*, 84(5):490–498, Sept./Oct. **1952.** bibliog. p. 490–498. **DLC**—The author reviews some of the theoretical and empirical evidence for the frontal origin of cyclones and anticyclones. The thermo-cyclogenesis theory of STÜVE and the theory of A. S. MONIN which even denies the need for baroclinicity in cyclogenesis, are briefly discussed. An extensive critical review is given of the advective dynamic theory of the origin of cyclones and anticyclones and for the supporting evidence. *Subject Headings:* **1. Cyclogenesis 2. Anticyclogenesis 3. Cyclone theories.**—*I.L.D.*

5.3–150 551.515.21

Sakuraba, S. (*Centr. Met. Obs., Tokyo*), **On the change of energies in a tropical cyclone.** *Geophysical Magazine*, Tokyo, 24(3):181–192, Jan. **1953.** fig., 6 refs., 15 eqs. **MH-BH**—HORIGUTI and MANTIS studied the energy transformation in a steady tropical cyclone adopting the energy equation of an open system. They took into account the energy flux across the boundary of a cyclone, while they assumed that no change occurs in the cyclone. In this paper it is shown that in the maintenance of kinetic energy of a tropical cyclone the energy exchange within the cyclone plays as important a part as the energy flux through its boundary. To account for this, an equation combining the energy equations of open and of closed systems is developed. *Subject Headings:* **1. Cyclone dynamics 2. Energy equations 3. Energy exchange.**—*From author's abstract.*

5.3–151 551.515.11

Sakuraba, S. (*Centr. Met. Obs., Tokyo*), **On the change of potential energy in a cyclone.** *Geophysical Magazine*, Tokyo, 24(2):108–116, Nov. **1952.** figs., 7 refs., 22 eqs. **MH-BH**—SPAR's conclusion that a cyclone cannot be regarded as a closed system since the potential energy increases in a developing cyclone is examined. It is theoretically proved that in a developing cyclone which has the wet-adiabatic upward motion the potential energy increases whether the cyclone has a horizontal temperature gradient or not. *Subject Headings:* **1. Cyclone dynamics 2. Dynamics of the atmosphere.**—*Author's abstract.*

5.3–152 551.515.1:551.509

Matsumoto, S., **On the coupling between upper waves and surface pressure centers (II).** *Papers in Meteorology and Geophysics*, 2(3–4):263–267, Dec. **1951.** 4 refs., eqs. **MH-BH**—Continuing previous investigations (*see item* 2.11–73, Nov. 1952, *MAB*) the author gives equations for the surface pressure change and moving velocity of the surface pressure center. In a long differential equation he considers the effect of horizontal advection along and across isobars, accompanied by divergence, the vertical motion, friction and unsteady motion. *Subject Headings:* **1. Dynamic meteorology 2. Pressure changes 3. Coupling effects.**—*A.A.*

5.3–153 551.515.13(481)

*Evjen, Sigurd, **Number and directions of cyclones passing Norway and the Norwegian Sea.** *Meteorologiske Annaler*, Oslo, 3(9):225–255, **1953.** 12 figs., 18 tables, refs. **DWB**—The lines ABCDE and abcde were drawn across Norway N to S and E to W, respectively, and the number and direction of the cyclones crossing each line during the interval 1946–1950 were determined. The cyclones are divided into three classes: I—pressure at center >1000 mb; II—pressure >980 and <1000 mb; and III—pressure <980 mb. The data are presented graphically and tabularly. The number of deepening and filling cyclones is examined and variations in number of cyclones passing each line is analyzed statistically. *Subject Headings:* **1. Cyclone frequencies 2. Cyclone tracks 3. Norway 4. Norwegian Sea.** —*I.L.D.*

5.3–154 551.515.13(261)

§Forsdyke, A. G., **A study of depressions crossing the region of Labrador and the St. Lawrence Basin.** *Great Britain. Meteorological Research Committee, M.R.P.* 777, Dec. 2, **1952.** 22 p. 25 figs., 3 tables, 6 refs. Mimeo. **DWB**—Relations between tracks of depressions near the American coast and the associated thickness and upper air patterns are studied. Depressions were classified according to track into and out of the area and the broad features of their behaviour are listed. Spells of the order of 10 days of similar types are described synoptically in Pt. 1. In Pt. 2 the deepening and movement of depressions are studied statistically in relation to thickness patterns. The large scale upper flow patterns give no consistent indications useful for medium range forecasting, as the thermal and surface patterns evolve together. *Subject Headings:* **1. Cyclone tracks 2. North Atlantic.**—*C.E.P.B.*

5.3–155 551.515.2:551.55

Gentry, Robert C., **Wind velocities during hurricanes.** *American Society of Civil Engineers, Proceedings*, v. 79, Separate No. 218, July **1953.** 26 p. 15 refs., eqs. **DWB**—This paper aims to provide the designing engineer with information on the strength of winds and gusts in hurricanes. The discussion covers the following topics: structure of hurricanes, duration of winds within hurricanes, forces, distribution of wind velocity within hurricanes, examples of high wind velocities recorded during hurricanes, gust factor and gust ratio, variation of wind velocity with height above ground and the probability of occurrence of hurricane force winds. *Subject Headings:* **1. Hurricanes 2. Hurricane force winds 3. Applied meteorology 4. Gust loads 5. Building design.**—*I.L.D.*

5.3–156 551.515.2

Rodewald, Martin, **T.S. "Heidelberg" und Hurrikan "Barbara."** ["Heidelberg" and hurricane "Barbara."] *Wetterlotse*, No. 61/62:177–196, Sept./Oct. **1953.** 4 figs. **DWB**—Report of winds and weather experienced by ship on Aug. 14–15, 1953, and synoptic account of hurricane. Track ran along coast from off Florida on 12th to Labrador on 17th. It can be traced as a wave disturbance back to Haiti on 9th. The difficulties of forecasting course and speed of hurricane are discussed; on the average tropical cyclones move with the steering current at about 9 km height, over a belt 900 km wide. Relations of wind to speeds of translation and rotation, and to temperature field in lower troposphere are discussed. The U. S. forecast underestimated the speed of advance of "Barbara" and nearly led the ship into its center. *Subject Heading:* **1. Hurricanes.**—*C.E.P.B.*

5.3–157 551.515.2(679)

§Rodewald, Martin, **Der Weihnacht-Orkan 1950 im Kanal von Mozambique.** [Hurricane of Christmas 1950 in the Mozambique Channel.] *Seewart;* Hamburg, 14(3):1–9, June **1953.** 10 figs. **DWB**—A very competent analysis of a hurricane, completely missed by the weather service due to lack of observations. The unexpected entering of a couple of ships into the hurricane could have been avoided if the captains would have relied on their own judgment and exchanged weather information with other ships. The center of the hurricane could have been easily detected observing the direction of swell from the two ships. *Subject Headings:* **1. Hurricanes 2. Marine meteorological observations 3. Swell 4. Mozambique Channel.** —*A.A.*

5.3–158 551.515.21(52):551.552

*Fujita, Tetsuya, **Analysis of winds in typhoon.** *Tobata, Japan. Kyushu Institute of Technology. Meteorological Laboratory, Report,* 3(1), April **1953.** 50 p. 43 figs. **DWB**—The wind field in typhoons is investigated in order to determine the amount of divergence and relative vorticity in connection with the observed pressure changes, precipitation patterns, stream lines, etc. of actual typhoons "Ruth"—Oct. 1951; "Akune"—Oct. 1945 and "Della"—June 1949. These typhoons are analyzed in great detail for the period when they were over southwest Japan. Surface charts, upper level charts, self-recorder traces for numerous land stations and specially constructed vorticity, convergence, tangential and radial velocity and stream line charts are included by way of illustration. *Subject Headings:* **1. Typhoons 2. Wind field in typhoons 3. Relative vorticity 4. Divergence in typhoons 5. Japan.**—*M.R.*

5.3–159 551.515.21:551.577

Ramage, C. S. and Hughes, Lawrence A., **The distribution of rain in tropical storms.** *Journal of Meteorology*, 10(4):300–302, Aug. **1953.** 8 refs. **MH-BH**—RAMAGE questions HUGHES' explanation (*Journal of Meteorology*, 9:422–428, 1952) of sudden change of surface friction when typhoons move over land, and resulting precipitation. HUGHES replies at length. *Subject Headings:* **1. Typhoon structure 2. Typhoon rainfall.**—*C.E.P.B.*

5.3–160 551.515.21

Sakuraba, S. (*Cent. Met. Obs., Tokyo*), **A note on the energy transformation in a tropical cyclone.** *Geophysical Magazine*, Tokyo, 24(4):219–221, March **1953.** 2 refs., 6 eqs. **MH-BH**—It is numerically shown how the condensation energy is transformed into the energy of pressure field of a tropical cyclone, and the latter into kinetic and potential energy. *Subject Headings:* **1. Energy equations 2. Cyclone dynamics 3. Tropical cyclones.**—*Author's abstract.*

5.3–161 551.515.21:523.75

Wexler, Harry and Palmer, C. E., **Direct solar influence on the atmosphere.** *Journal of Meteorology*, 10(4):302–306, Aug. **1953.** tables, 8 refs. Kaplan, Lewis D.; Palmer, C. E.; Fisher, Edwin L., **The impulsive generation of certain changes in the tropospheric circulation.** *Ibid.*, p. 306–309. table, 13 refs. **MH-BH**—WEXLER discusses some points in paper by PALMER (*see item* 4.9–109, Sept. 1953, *MAB*). PALMER gives table of minimum temperatures and corresponding pressures (around 100 mb) at Bikati and Majuro, March 1–May 18, 1951. KAPLAN considers that PALMER's mechanism could not account for absorption of large amount of UV energy necessary to explain observed heating over Bikati, and solar UV activity cannot directly result in significant heating below ozone maximum. FISHER criticizes dismissal of subsidence as a warming agent in lower stratosphere. PALMER replies in each case. *Subject Headings:* **1. Hurricane formation 2. Solar flares. I. Kaplan, Lewis II. Fisher, Edwin L.**—*C.E.P.B.*

5.3–162 551.515.21

Simpson, R. H. and Palmer, C. E., **Comments on "The impulsive generation of certain changes in the tropospheric circulation."** *Journal of Meteorology*, 10(5):404–406, Oct. **1953.** table, ref. **MH-BH**—SIMPSON discusses paper by PALMER (*see item* 4.9–109, Sept. 1953, *MAB*) and gives a table of frequency and movement of 300 mb lows secluded south of maximum westerlies in 0–50°N, 130°E–125°W. He also criticizes use of terms Kona low and Kona layer. PALMER replies briefly. *Subject Heading:* **1. Hurricane formation.**—*C.E.P.B.*

5.3–163 551.515.21

Syōno, S. (*Geophysical Inst., Tōkyo Univ.*), **On the formation of tropical cyclones.** *Tellus*, 5(2):179–195, May **1953.** 5 figs., 7 tables, 5 refs., 118 eqs. **MH-BH**—A theoretical paper attempting to obtain dynamically the criterion for the formation of tropical cyclones. The main factors in typhogenesis are vertical thermal instability, horizontal dynamical stability and horizontal and vertical dimensions of perturbations. A physical model of typhogenesis is given and a polytropic method for treating latent instability is proposed. The perturbation equations for typhoon-type tropical cyclones are derived by this method. The criterion for the development of perturbations of typhoon-type is:

$$\frac{-gS}{Z^2} \begin{matrix} > \\ < \end{matrix} 76n^2\mu_0^2 \begin{matrix} \text{develop} \\ \text{neutral} \end{matrix}$$

where g, S, Z, n and μ_0 are gravity acceleration, vertical thermal instability, absolute vorticity, number of loops in perturbations in vertical direction and number which gives horizontal dimension of perturbation in 100 km, respectively. The left hand side has a form similar to Richardson's number for the formation of turbulence. Also the modes of perturbation are studied. *Subject Headings:* **1. Typhoon dynamics 2. Cyclogenesis 3. Typhoon formation.**—*Based on author's abstract.*—*I.L.D.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Ultraviolet radiation** (Koller), 5.3–5; **Free balloon flights in great heights** (Powell), 5.3–34; **Grazing-incidence integral Ch** (x, χ), 5.3–109; **Radiation flux of helium atmos.** (Aller and others), 5.3–120; **Radiation heat exchange between snowpack and environment** (Himmel), 5.3–263; **Solar control and orientation for bioclimatic requirements** (Olgyay), 5.3–302.

5.3–164 551.521:535.33:518.3

Kavanagh, R. W., Gjörnerud, E. K. and Penner, S. S. (*Calif. Inst. of Technology, Pasadena*), **Nomogram for the evaluation of blackbody and of peak and total intensities for spectral lines with Doppler contour.** *Optical Society of America, Journal*, 43(5):380–382, May **1953.** 2 figs., refs., 8 eqs. **DLC**—A nomogram has been constructed for the determination of blackbody radiancy and of peak and total intensities for spectral lines with Doppler contour. The basic equations used for the construction of the nomogram and the use of the nomogram are described briefly. A method is outlined for determining absolute values of total intensities for spectral lines with combined Doppler and resonance contour by using the nomogram in conjunction with the "curves of growth." *Subject Headings:* **1. Black body radiation 2. Doppler effect 3. Nomograms.**—*Authors' abstract.*

5.3–165 551.521:535.33:518.3

Kavanagh, R. W. and Penner, S. S. (*Calif. Inst. of Technology, Pasadena*), **Nomogram for the evaluation of blackbody radiancy and of peak and total intensities for spectral lines with Lorentz contour.** *Optical Society of America, Journal*, 43(5):383–384, May 1953. fig., ref. **DLC**—A nomogram has been constructed for the determination of blackbody radiancy and of peak and total intensities for spectral lines with Lorentz contour. The basic equations used for the construction of the nomogram and the use of the nomogram are described briefly. *Subject Headings:* **1. Black body radiation 2. Nomograms.**—*Authors' abstract.*

5.3–166 551.521.11(729.9)

*Macky, W. A., **Sunshine in Bermuda.** *Bermuda. Meteorological Office, Technical Note*, No. 5, **1952.** 32 p. 6 figs., 21 tables. **GB-MO**—Detailed study of Campbell-Stokes records since 1927 including averages, frequencies and hourly means. A correction is given for "low sun." *Subject Headings:* **1. Sunshine duration 2. Bermuda.**—*C.E.P.B.*

5.3–167 551.521.11

*Schüepp, Max, **Bestimmung der möglichen Sonnenscheindauer mit dem Wild-Theodoliten T12.** [Measurement of probable sunshine duration with the Wild theodolite T12.] *Switzerland. Meteorologische Zentralanstalt, Annalen*, vol. 88, **1951.** 4 p. appended to Anhang No. 7, 4 p. 2 figs., 2 tables, ref. **DWB**—The theodolite is described and illustrated and methods of orientation (astronomically and geographically) outlined. Detailed maps and tables are presented to aid in such orientation and in the calculations of possible hours of sunshine for each day of the year for any place in Switzerland. *Subject Headings:* **1. Sunshine tables 2. Sunshine duration 3. Switzerland.**—*M.R.*

5.3–168 551.521.14:523.43

Barabashev, N. P., **Ob issledovanii razlichnykh obrazovaniĭ na Marse.** [Investigation of various phenomena on Mars.] *Astronomicheskiĭ Zhurnal*, 29(5):538–555, Sept./Oct. **1952.** 7 tables, 13 refs. **DLC**—Detailed tabular and descriptive analysis of observations of the brightness (spectral reflectivity) or albedo of various "seas," "gulfs," "lakes" and "continents" of Mars, made by the author with blue, green and red filters in 1931, 1935, 1939, 1941 and 1950. Other observations were made in 1920, 1924, 1926 and 1930. Conclusions drawn regarding the atmosphere, surface covering in equatorial and polar regions and along the edges when the sun rises or sets or changes noon angle. The seas have regions of varying albedo and colors ranging from green to yellow to blue to reddish, and on the continents the albedo and

shading changes with time of day. The "seas" become more reddish when the noonday sun is lower and more bluish when it is higher. On the continents the albedo in red is as high as .448, yellow .190 and green .193. (See also Kubashev, item 3.6–14 in June 1952, *MAB*). *Subject Headings:* **1. Mars 2. Albedo 3. Planetary atmospheres.**—*M.R.*

5.3–169 551.521.14:551.578.46

Miller, David H., **The depletion method of estimating solar radiation absorbed by the snow.** U. S. Corps of Engineers, Project CW-171, Technical Bulletin No. 5, April 10, **1950.** 11 p. 3 tables, graph, refs. **DWB**—The method described in this paper is based on computations of W. H. KLEIN reported in *Journal of Meteorology*, 5:119–129, 1948. Values of depletion due to scattering, reflection and absorption by air, dust, water vapor and clouds are deducted from the initial value of solar heat outside the atmosphere, thus providing final values of incoming radiant energy. Through use of methods to estimate albedo of the snow surface by its age and time of day, the value of solar radiation absorbed by the snow pack can be computed. Methods for obtaining the detail values and for computing them are discussed and explained with practical examples from data at the Central Sierra Snow Laboratory and the Upper Columbia Snow Laboratory. *Subject Headings:* **1. Albedo of snow 2. Absorption by snowpack 3. Snow pack 4. Central Sierra Snow Laboratory 5. Upper Columbia Snow Laboratory. I. Project CW-171.**—*G.T.*

5.3–170 551.521.14:535.4

Nimeroff, I. (*Natl. Bureau of Standards, Wash., D. C.*), **Analysis of goniophotometric reflection curves.** *Optical Society of America, Journal*, 42(8):579–583, Aug. **1952.** 3 figs., 3 tables, 12 refs., 9 eqs. **DWB**—Surface appearance, apart from texture, is defined by the goniophotometric curve giving the angular distribution of the reflected light. A summary of current goniophotometric techniques shows that essential parts of these fundamental data have been neglected. This paper applies an established method of statistics to the problem of goniophotometric-curve analysis and interpretation whereby such data are reduced to dispersion, skewness and kurtosis indexes. The kurtosis index is shown to correlate better with subjective estimates of the distinctness of the reflected images than the conventional measure, 60° specular gloss. The kurtosis index is applied to one problem in the selection of optimum glossmeter geometry. *Subject Headings:* **1. Albedo measurement 2. Photometry.**—*Author's abstract.*

5.3–171 551.521.14:551.521.64

V—, A., **Issledovanie al'bedo zemnoĭ atmosfery dlia kosmicheskogo izlucheniia s pomoshch'iu effekta CHerenkova.** [Albedo investigation of the earth' atmosphere for cosmic radiation by means of CHerenkov's effect.] *Uspekhi Fizicheskikh Nauk*, 48(1):131–132, Sept. **1952.** 2 figs., 4 refs. **DLC**—Review on recent papers, published by WINCKLER (*Physical Review*, 85:1053–1054, 1952) on equipment measuring albedo of cosmic rays in the stratosphere (pressure 17 $g.cm^{-2}$). *Subject Headings:* **1. Albedo of cosmic rays 2. Stratospheric research.**—*A.A.*

5.3–172 551.521.16

*Alvarez-Castrillón y Bustelo, Manuel, **La clara del cel a Barcelona.** [Sky brightness at Barcelona.] *Catalonia. Servei Meteorologic, Memòries*, 1(2), **1937.** 52 p. 29 tables, 35 diagrs. In Catalan, French summary p. 52. **DWB**—Measurements of sky brightness were made at Barcelona during 1924 and 1925 with a Herxheimer photometer and the results tabulated and presented in numerous solar diagrams. The effect of the sun's height, various types of clouds and of an eclipse are noted and compared. The photometer is described and illustrated and the calibrations and corrections presented. Observations with a Weber photometer are also given in detail. Zenith sky brightness with various cloud and sun conditions shown graphically. Observations during eclipse of Jan. 24, 1925 are analyzed in the same manner. *Subject Headings:* **1. Sky brightness 2. Solar eclipses 3. Catalan language 4. Barcelona, Spain.**—*M.R.*

5.3–173 551.521.63:616

Blum, Harold F. (*Princeton Univ.*), **Effect of loss of sunlight on human health.** *U. S. Technical Conference on Air Pollution, Washington, D. C., 1950, Air Pollution*, p. 499–500. Discussion p. 501–502. fig. **DLC**—The region of the spectrum laying between about 0.32μ and the lower lines of sunlight at 0.29μ, which is especially susceptible to air pollution, is important to human health. It activates provitamin D, and causes sunburn; evidence exists that it is cancerogenic; and it has bactericidal effect. The author also stresses the fact that sunlight has an intra-atmospheric effect as, for example, changing SO_2 to SO_3 in the presence of catalysts and that it plays a psychological role. *Subject Headings:* **1. Sunlight effects 2. Bioclimatology.**—*I.L.D.*

5.3–174 551.521.16

Pearson, Carl August (*Naval Res. Lab. Optics Div.*), **Daytime measurement of atmospheric transmission of light.** *U. S. Naval Research Laboratory, Report* 3993, July 10, **1952.** 12 p. 12 figs., 2 tables, 5 refs., 11 eqs. **DWB**—Measurements of the atmospheric transmission of light were made by two photoelectric brightness meters, comparing the apparent brightness of a light, sandy area and of a dark area in an arid region. The average elevation of the light path with a length of 17 mi was about 5200 ft. Another method used on cloudless days was the visual measurement of the brightness of a bluff at a distance of about 22 mi. The results obtained by the two methods are in good agreement. The data presented can be used to calculate the diurnal course of transmission as an average for about 9 days. *Subject Headings:* **1. Atmospheric transmission 2. Brightness measurements 3. Daylight illumination.**—*A.A.*

5.3–175 551.521.16:595.7

Pleskot, Gertrud and Pomeisl, Ernst, **Bedeutung der Lichtintensität beim Schlüpfen und bei der Eiablage von aquatischen Insekten, im besonderen von *Torleya belgica*.** [Importance of light intensity in the molting and oviposition of aquatic insects, particularly of *Torleya belgica*.] *Wetter und Leben*, Sonderheft No. 1:41–47, May **1952.** 2 tables. **MH-BH**—The flight of females of *Torleya belgica* occurs for about 55 minutes after setting of sun below the horizon. This flight begins about 25 minutes earlier on cloudy days. The relationship between light and the behavior of other insects and the role of air temperature and humidity are discussed. A table showing the relationship of beginning and termination of flight to light intensity is given. *Subject Headings:* **1. Daylight illumination effects 2. Insects.**—*I.L.D.*

5.3–176 551.521.3(624)

Beck, C. J.; Lovell, D. J. and Hulburt, E. O. (*Naval Res. Lab., Wash., D. C.*), **Atmospheric attenuation at Khartoum, Sudan.** *Optical Society of America, Journal*, 43(5):405–406, May **1953.** 2 figs., table, ref., eq. **DWB**—Photopic attenuation (attenuation of sunlight viewed with the light-adapted eye) of the atmosphere over Khartoum was measured with a Macbeth illuminometer during the period Feb. 14–25, 1952. The attenuation of various wavelengths was determined. Results are presented in a table and a graph. A graph of relative values of solar illumination at Khartoum at various times of the day is also presented. Atmospheric clarity on Feb. 21 was comparable to that on a mountain top. On Feb. 25 it was like on a clear summer day in Maryland. *Subject Headings:* **1. Atmospheric absorption 2. Spectral transparency of atmosphere 3. Eclipse expedition, Feb. 1952 4. Khartoum, Sudan.**—*G.T.*

5.3–177 551.521.3:551.571

Denver. University. Dept. of Physics, **Daylight luminescence and infrared absorption.** Contract W19-122ac-16, Quarterly Report No. 14, Oct. 31, **1951.** 12 p. 14 plates (1 fold.). **DWB**—Preparation of equipment for the use at an eclipse expedition in Khartoum, Egypt. Design of spectrographs with ultraviolet and infrared camera systems and the mounting of the spectrograph for the airplane and for use as balloon equipment are described. The method of Fowle for computing precipitable water vapor and the construction of calibration curves for atmospheric moisture are discussed. *Subject Headings:* **1. Spectrographs 2. Precipitable water vapor 3. Upper atmosphere instruments 4. Eclipse expedition, Feb. 1952. I. Contract W19-122ac-16.**—*A.A.*

5.3–178 551.521.3:551.571

*†Dickson, Don R., **An approximate method for determining the amount of solar radiation absorbed by water vapor in the atmosphere.** Utah. Univ. Meteorology Dept., Contract AF 19(122)–256, Scientific Report, No. 5, [1953?]. 25 p. 6 figs., 8 tables, 66 refs., 16 eqs. **DWB**—The solar emission spectrum and the water vapor absorption spectrum were divided into twenty-four bands, within each of which a constant emission and a constant apparent mass absorption coefficient were assumed. Step integrations produce the contributions to the total intensity divergence within each of the fourteen spectral regions for the day. Rates of heating are computed for radiosonde observations made along the 80th meridian west on two dates; one dominated by tropical air to a very high latitude, and one dominated by polar air to a very low latitude. *Subject Headings:* **1. Absorption by water vapor 2. Solar radiation measurement. I. Utah. Univ. Meteorology Dept. II. Contract AF 19(122)-256.**—*Author's abstract.*

5.3–179 551.521.31:551.590.24

IAroslavtsev, I. N., **Rezul'taty aktinometricheskikh izmereniĭ vo vremia solnechnogo zatmeniia 25 fevralia 1952 g. v Tashkente.** [Results of actinometric measurements during the solar eclipse of Feb. 25, 1952 in Tashkent.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geofiz.*, No. 6:83–87, 1952. 5 figs., 2 tables, 2 refs. **DLC**—The distribution of the brightness of the sky in the infrared rays was measured during the eclipse and the results are shown on equivalent polar projections. The components of the radiational balance during the eclipse were recorded automatically. At the beginning the total positive radiational balance diminished rapidly, reached zero after first contact and then became negative; after completion of eclipse, the positive balance was three times greater than at the start. The variation of the infra-red radiation intensity with the eclipsing of the solar disk by the moon is analyzed. *Subject Headings:* **1. Solar eclipse, Feb. 1952 2. Sky brightness 3. Tashkent, U.S.S.R.**—*I.L.D.*

5.3–180 551.521.32

Kondrat'ev, K. IA., **O zavisimosti pogloshcheniia dlinnovolnovoĭ radiatsii v atmosfere ot temperatury i davleniia.** [Dependence of absorption of long wave radiation in the atmosphere on temperature and pressure.] *Akademiia Nauk SSSR, Ser. Geofiz.*, No. 5:69–75, 1952. 2 figs., 3 tables, 7 refs., 9 eqs. **DLC**—Theoretical considerations on the influence of various factors on the absorption of long wave radiation in the atmosphere. In practice only the temperature and pressure dependence of absorption should be considered. Author assumes that the half width of the absorption line is proportional to $\sqrt{p}$ (p—pressure) and $\sqrt[4]{T}$ (T—absolute temperature). For rough calculations the water vapor amount can be reduced by 10%. *Subject Headings:* **1. Long wave absorption 2. Pressure dependence of absorption 3. Temperature dependence of absorption.**—*A.A.*

5.3–181 551.521.32:69

Rapp, G. M. (*John B. Pierce Foundation*), **Performance and properties of materials in hot climates.** [In: National Research Council, Wash., D. C. Building Research Advisory Board, **Housing and building in hot-humid and hot-dry climates, Nov. 18–19, 1952, Proceedings,** p. 109–120, 1953. figs., tables, 15 refs.] **DWB**—After pointing out the fact that the only properties of materials with the exception of those related to durability, that are particularly important in providing comfort in tropical climates are ascribable to temperature, the author discusses heat capacity, solar absorptivity and emissivity, insolation, namely direct transmission of sun and sky radiation through windows and moisture effects on the relationship between moisture absorption properties of buildings and their thermal properties. Tables giving values of various thermal properties of materials affecting solar heat exchange, kpc values of interior lining and exterior facing materials and its effect (calculated) on rate of cooling of inside surfaces, reflectivity of building materials, etc. are included. *Subject Headings:* **1. Thermal properties of building materials 2. Heat exchange 3. Absorption of terrestrial radiation 4. Tropical housing.**—*I.L.D.*

AIR TEMPERATURE

See also: **Min. night temp. at/or near full moon** (Henstock), 5.3–3; **Eddy diffusion of momentum, water vapor and heat near ground** (Rider), 5.3–11; **Temperature** (S. Africa, Met. Off.), 5.3–52; **Standards of temp.** (Wilson), 5.3–53; **Mean temp., Central England 1698–1952** (Manley), 5.3–63; **80-year mean temp., S. Upper Rhine region** (von Rudloff), 5.3–64; **Critical review of ionospheric temp. data** (Gerson), 5.3–127; **Ionospheric temp.** (Gerson), 5.3–128; **Vertical mean wind profiles in atmos. surface layer** (Deacon), 5.3–213; **Annual variations of upper air winds and temp.** (Crary), 5.3–226; **Temp. and moisture gradients under low stratus** (Kraght), 5.3–235; **Upper air winds, Nairobi** (Carruthers), 5.3–303.

5.3–182 551.524:551.577:519.241.1

†*Krames, Karl, **Die Korrelation zwischen Temperatur- und Niederschlagsanomalien im Winter der Nordhemisphäre.** [The correlation between temperature and precipitation anomalies in winter in the Northern Hemisphere.] Thesis (*Ph.D.*)—Cologne University, **1951.** 45 p. tables, 90 maps, photostats (in pocket), 70 refs. Mimeo. **DWB**—Study, published also in *Geografiska Annaler*, 33 (3/4), 1951 (*see item* 4.2–142, Feb. 1953, *MAB*), is here presented in greater detail with original charts and a greater literature coverage. *Subject Headings:* **1. Temperature-precipitation correlation 2. Climatic variations 3. Glaciers 4. Anomalies 5. Northern Hemisphere.**—*A.A.*

5.3–183 551.521.4:551.594.51:551.524.7

Armstrong, E. B., **A note on the use of the Fabry-Perot etalon for upper atmosphere temperature measurements.** *Journal of Atmospheric and Terrestrial Physics*, 3(5):274–281, June **1953.** 4 figs., 9 refs. **MH-BH**—Interferometer observations of the aurora by H. D. Babcock and L. Vegard are used to discuss possibility of determining upper air temperatures from contrast in fringe photographs. Background sky-light introduces a serious error and suggestions are made for allowing for it. *Subject Headings:* **1. Night airglow spectrum 2. Auroral spectra 3. Upper air temperatures.**—*C.E.P.B.*

5.3–184 551.521.4:535.34

Pillow, M. E., **Intensity distribution among bands of the Herzberg System of O_2.** *Physical Society of London, Proceedings, Ser. A*, 66(404):733–736, Aug. **1953.** 2 figs., table, 8 refs. **DWB**—Relative band-intensities are calculated and compared with Barbier's measurements on the emission of the night sky. Some differences are tentatively attributed to absorption in the night sky. *Subject Heading:* **1. Night airglow spectrum.**—*C.E.P.B.*

5.3–185 551.524.36

Thom, Herbert C. S. (*U. S. W. B., Wash., D. C.*), **Seasonal degree-day statistics for the United States.** *Monthly Weather Review*, 80(9):143–147, Sept. **1952.** 3 figs., 4 refs., 5 eqs. **MH-BH**—It is shown that the normal distribution can be used in fitting total seasonal degree-day data and in estimating probabilities of occurrence of values exceeding or falling below given totals, etc. Charts of the mean seasonal heating degree-days for the U. S. based on data from 266 stations, and of standard deviation of same, are presented and enable all of the desired information to be calculated for any place in the U. S. (allowing for errors in smoothing or interpolating). Examples are given of the use of such charts with the aid of a brief table of normal probability distribution (Wash., D. C. and Detroit), and a method of estimating confidence intervals for the mean or normal also given. *Subject Headings:* **1. Degree-day data 2. Statistical methods in climatology 3. United States.**—*M.R.*

5.3–186 551.524.37:632.111

Aichele, H., **Lokalklimatische Froststudien am westlichen Bodensee.** [Local climatic frost studies on the western part of Lake Constance.] *Meteorologische Rundschau*, 6(7/8):126–130, July/Aug. **1953.** 2 figs., 15 refs. **DWB**—Charts of frost damage in spring and autumn were drawn for 1951–53, especially for May 21, 1952, by enquiries of farmers and auto journeys with a meteorograph on frost nights to obtain temperature profiles. Cold air pools were charted and are shown on a map, including several zones of frost hazard. The various valleys

are discussed in detail with notes on the depths of the cold air pools. *Subject Headings:* **1. Frost distribution 2. Frost damage 3. Lake Constance.**—*C.E.P.B.*

5.3–187 551.524.37

Franken, E., **Statistik des ersten und letzten Auftretens von Frösten bestimmter Stärkestufen in Münster/Westfallen.** [Statistics of first and last occurrence of frosts of specified severity in Münster.] *Meteorologische Rundschau*, 6(7/8):130–131, July/Aug. **1953.** fig., 3 refs. **DWB**—Smoothed cumulative curves are drawn (on a 50 years basis) for the frequency with which any day comes after the first frost of fall, or before the last frost of spring, for temperatures below 0, −2, −4, and −6°C. *Subject Headings:* **1. Frost frequencies 2. Münster, Germany.**—*C.E.P.B.*

5.3–188 551.524.37:634.9

*Isida, Sigeo, **Study on the cracking of trees due to frost.** *Teion Kagaku* [*Low Temperature Science*], Sapporo, Japan, 5:61–73, **1950.** 12 figs., 7 refs. In Japanese; English summary p. 73. **DWB**—Conifers and deciduous trees were studied to see when and where cracks formed and it was found that conifers cracked when wood was wet on the inside. Temperature of −20°C was used in cold chamber. Sapwood froze first and then wet wood at interior. *Subject Heading:* **1. Frost damage to trees.**—*M.R.*

5.3–189 551.524.37

Juusela, Taneli, **The effect of the draining procedure on the humidity of the soil, the frost and the ground temperature.** *I.U.G.G. International Association of Scientific Hydrology, Oslo, 1948*, [*Transactions*], v. 3:287–289, [1951?]. **DWB**—Graphical presentation of ground temperatures at different distances between pipe-drains and open ditches measured near Helsinki in April and May 1941. General discussion of humidity and frost conditions in the ground. *Subject Headings:* **1. Frost 2. Soil moisture 3. Helsinki, Finland.**—*A.A.*

5.3–190 551.524.37

Lawrence, E. N., **Late spring frosts.** *Weather*, 8(5):137–138, May **1953. MH-BH**—Short general article on folk-lore of frost and frost protection or avoidance. *Subject Headings:* **1. Frost 2. Weather lore.**—*C.E.P.B.*

5.3–191 551.524.37(71)

Potter, J. G., **May in Canada.** *Weather*, 8(10):321, Oct. **1953. MH-BH**—Lowest May 1953 temperatures, Geraldton 2°F, Long Lac 4°F; −11°F, occurred at White River in May 1903. The blizzard in May 1953 was the second worst on record. *Subject Headings:* **1. Temperature extremes 2. Canada.**—*C.E.P.B.*

5.3–192 551.524.37:63

Suzuki, S. and Arai, T. (*Training School of Met. Observers, Japan*), **Does frost really bring injury to plants? (Preliminary Report, Part 2).** *Journal of Agricultural Meteorology*, Tokyo, 7(3/4):127–130, Nov. **1952.** 3 figs., table. In Japanese; English figure captions. **MH-BH**—Data on cooling rates of several varieties of vegetables measured under experimental and natural conditions are presented in graphical form and commented on. (For Pt. 1 *see item* 4C–314, March 1953, *MAB.*) *Subject Heading:* **1. Plant freezing.**—*G.T.*

5.3–193 551.524.37:551.509.53

*U. S. Weather Bureau. Fruit-Frost Service, **Sixteenth annual report of minimum temperature forecasts and fruit-frost survey in Tulare County, California, 1953 spring season. 1953.** 28 p. 8 tables, map (fold. in back). **DWB**—A routine report for an unusually cold season with greatest number of "cold nights" (25 at 32.0°F) in this area of central California. Phenological data, itemized forecast distribution data, location and exposure of each of 28 temperature stations, forecast data for Lindsay key station for all nights of the season, verifications of forecasts for each section of area for cold nights, detailed minimum temperature data for key station and averages and extremes for all stations, duration of temperature below specified values for all stations on "cold nights," and daily observations for Lindsay. A

detailed map of the county showing stations is attached. *Subject Headings:* **1. Fruit-Frost Service 2. Forecast verification 3. Minimum temperature forecasting 4. Tulare County, Calif. I. Crossan, Thomas R.**—*M.R.*

5.3–194 551.524.4

du Chaxel, Raoul, **Sur le champ de température de l'atmosphère.** [Temperature field of the atmosphere.] *Académie des Sciences, Paris, Comptes Rendus,* 237(1):86–88, July 6, **1953.** eq. **DWB**—The notion of vertical temperature gradient as conceived so far calls for a slight modification. This statement is based on information obtained in flight. During March, April and May 1953 (27 flights) the author measured the temperature distribution in the Paris region in horizontal planes at various altitudes between 900 and 3,340 m in an area of 14×20 km which was covered in about 30 minutes (temperature readings being taken every 15 sec) usually in a clear sky. Isotherms were drawn for each horizontal section. The temperature variation within a section was found to be between 0.3 and 2.8°C. From a preliminary analysis of the data obtained it appears that the atmosphere is divided into horizontal layers of varying thickness and that a wave-like motion takes place within each individual layer. *Subject Headings:* **1. Vertical temperature gradient 2. Air temperatures 3. Airplane observations.**—*G.T.*

5.3–195 551.524.4

*Johnson, William R. (*U.S.A.F., Norton AFB, Cal.*), **Diurnal height variations of the temperature inversion in Southern California.** [1952.] 1 p. 5 figs. in photostat. Typescript. **DWB**—Monthly averages of height and temperature of base and top of inversion at Long Beach, Calif., are shown on separate adiabatic charts for 1, 7, 13 and 19 h. (Pacific Standard Time), showing for each hour a lowering of the height from June to Aug. Data for the 3 months were combined to give average height changes throughout the 24 hours, and the diurnal march, shown in graphic form. At average heights of the base (1000′ to 2000′) the inversion lowers between 0800 and 1900 and raises between 1900 and 0700 P.S.T. The top ranges from 3800 to 3000 ft from June–Aug. *Subject Headings:* **1. Temperature inversion data 2. Radiosonde data 3. Adiabatic charts 4. Long Beach, Calif.**—*M.R.*

5.3–196 551.524.4:551.553.1

Maruyama, E. (*Central Met. Obs., Tokyo*), **Relations between the vertical temperature difference and wind speed near the ground during daytime.** *Journal of Agricultural Meteorology,* Tokyo, 7(3/4):117–118, Nov. **1952.** fig., 2 tables, 4 refs. In Japanese; English summary p. 118. **MH-BH**—The author investigated the influence of wind speed at 1 m height upon the temperature difference between 10 cm and 150 cm height. There is evidence that the temperature difference is decreasing while wind speed is increasing. This relation is maintained during daytime in good weather conditions. *Subject Headings:* **1. Wind effects 2. Vertical temperature variations.**—*From author's abstract.*

5.3–197 551.524.7:551.507.362

aufm Kampe, H. J., **Neuere Stratosphärendaten.** [New stratosphere data.] *Meteorologische Rundschau,* 6(5/6):99–100, May/June, **1953.** fig. **DWB**—Some rockets were built in Peenemünde for investigations up to 60 km. Work was continued by U. S. Rocket Panel. Six temperature-height curves obtained by different methods at White Sands are shown and discussed. *Subject Headings:* **1. Temperature profiles 2. Rocket soundings 3. White Sands, New Mexico.**—*C.E.P.B.*

5.3–198 551.524.7:551.547.3:551.543

Dady, G. (*Établissement d'Études et de Recherches Met., Magny les Hameaux*), **Variations de température et variations de pression dans la troposphère.** [Temperature variations and pressure variations in the troposphere.] *Journal Scientifique de la Météorologie,* Paris, 4(16): 117–125, Oct./Dec. **1952.** figs., tables, eqs. In French; French, English and Spanish summaries p. 117. **DWB**—A statistical study of aerological soundings (at Trappes) to determine the effect of temperature changes in the 1000, 700, 500 and 300 mb levels on pressure at these or at respectively lower levels. The conclusion is that the advective changes are most intense

and most significant at the higher levels, and that surface pressure changes are the most independent of upper level temperature changes. *Subject Headings:* **1. Tropospheric advection 2. Pressure changes.**—*M.R.*

5.3–199 551.524.7:551.593.55

Grandmontagne, Raymond, **Temperature de l'atmosphère et discontinuités crépusculaires.** [Temperature of the atmosphere and twilight discontinuities.] *Académie des Sciences, Paris, Comptes Rendus*, 236(10):1066–1067, March 9, **1953.** refs. **DWB**—The extremely high temperature found at 50 or 60 km (440°K) was thought to be the cause of the sudden discontinuity in twilight (GAUZIT and GRANDMONTAGUE, 1942). Recent evidence from rocket flights in the U.S.A. and twilight measurements in France leads the author to believe that the steep temperature gradients in the 50–60 km zone are really the cause of such discontinuity. *Subject Headings:* **1. Stratospheric temperature maximum 2. Twilight discontinuities.**—*M.R.*

5.3–200 551.524.7:551.510.53

Scherhag, Richard, **Rätselhafte Temperatursprünge in der Stratosphäre.** [Mysterious temperature discontinuities in the stratosphere.] *Umschau*, 53(21):646–648, Nov. 1, **1953.** fig., 4 tables, 4 refs. **DWB**—Recent high radiosonde ascents at Berlin show that at 35 km the annual variation of temperature exceeds 30°C and at 20–30 km temperature may change by 30°C in a few days, as in Jan.–Feb.–March 1952. Possible causes are mainly related to solar eruptions. The phenomena cause unusual behavior in the troposphere and lessen accuracy of forecasts. *Subject Heading:* **1. Stratospheric temperature variations.**—*C.E.P.B.*

SOIL TEMPERATURE

See also: **Temp.** (S. Africa, Met. Off.), 5.3–52.

5.3–201 551.525.2

*Daigo, Y. and Maruyama, E., **Micrometeorological study on the effect of strawmatting.** *Japan. Central Meteorological Observatory, Tokyo, Memoir of Industrial Meteorology*, 16(1):27–32, Aug. **1952.** 6 tables. In Japanese; English summary p. 2. **MH-BH**—Tabular and graphical experimental data are presented on diurnal variation in winter soil surface temperature of bare ground and of ground covered with a straw matting of varying thickness, all day or during part of the day. The experimental results are summed up in expressions representing soil temperature as a function of surface temperature variation, thickness of matting, and depth. *Subject Headings:* **1. Soil surface temperatures 2. Mulch.**—*G.T.*

5.3–202 551.525.4:551.578.46

Benfield, A. E., **The effect of accumulation on temperature within a snowfield.** *Journal of Glaciology*, 2(14):250–254, Nov. **1953.** 4 figs., 3 tables, 6 refs. English and German summaries p. 250. **DLC**—Assuming annual temperature variation at surface of a snowfield to be a sine curve (0 to −20°C), diffusivity 7.3×10^{-2} cm²/s and constant snowfall at rate of 0, 4 and 8 m/year, temperatures are calculated at different depths and times of year. Owing to blanketing effect of snow, the minimum temperature (in June) at depths of 4–8 m is 5–6°C lower with 8 m snowfall than with no snow. *Subject Heading:* **1. Snow cover temperatures.**—*C.E.P.B.*

5.3–203 551.525.5:551.578.46 551.525.4:551.584.4

Bay, Clyde E., Wunnecke, George W. and Hays, Orville E., **Frost penetration into soils as influenced by depth of snow, vegetative cover, and air temperatures.** *American Geophysical Union, Transactions*, 33(4):541–546, Aug. **1952.** 3 figs., 2 tables, 4 refs. **MH-BH**—Frost penetration and removal in the Miami silt loam and the Almena silt loam were measured by resistance readings made on plaster of Paris blocks located at intervals in the soil profile to a 36-inch depth. As the soil water freezes, the unit resistance rises sharply. Dense vegetative and snow cover insulate the soil and reduce the rate of soil freezing and thawing. Winter wheat gave very little protection to the soil. Graphs are included which show frost penetration

and removal on hay, winter wheat, and plowed land on the Miami silt loam. Eighteen inches of snow insulated the Almena soil sufficiently to prevent frost penetration to a depth of 12 inches when the weekly average daily minimum temperatures were as low as −13°F. Eighteen inches of snow did not prevent frost penetration when the average minimum temperature was −21°F. However, 24 inches of snow cover prevented frost penetration at −21°F. Graphs are included showing the frost movement into and out of the Almena soil under varying depths of snow cover. The soil thaws from both the surface and from the lower frost line. *Subject Headings:* **1. Frost penetration in soil 2. Soil freezing 3. Vegetation influences 4. Snow cover effects 5. Wisconsin.**—*Author's abstract.*

5.3–204 551.525.5

†*Lovell, Charles W., Jr. and Herrin, Moreland (*Purdue Univ.*), **Review of certain properties and problems of frozen ground, including permafrost.** *U. S. Snow, Ice and Permafrost Research Establishment, SIPRE Report,* No. 9, March **1953.** 124 p. 25 figs., 5 tables, refs. **DWB**—A concise literature and research review, limited almost entirely to items published in English and giving mostly results of American research on the engineering aspects of frost action. Among the many subjects covered we find the theory of frost action, cyclic freezing and thawing, frost heaving and soil movement on slopes, structure, thermal properties and composition of unfrozen and frozen ground, strength, density, degree of saturation and freezing point of soils. Finally, surface icing and icing control is discussed. *Subject Headings:* **1. Frozen soil 2. Permafrost 3. Frost 4. Engineering meteorology. I. Purdue University. Engineering Experiment Station.**—*A.A.*

SEA TEMPERATURE

5.3–205 551.526.6(729) 551.46

Boden, Brian P. (*Bermuda, Biological Station*), **Natural conservation of insular plankton.** *Nature,* London, 169(4304):697–699, April 26, **1952.** 2 figs. **DWB**—A study of marine conditions in the Bermuda region, including a chart of surface density of sea water and two vertical sections of sea temperature. The water circulation in summer is thermal and anticyclonic, conserving the plankton. *Subject Headings:* **1. Sea temperatures 2. Oceanographic surveys 3. Bermuda.**—*C.E.P.B.*

5.3–206 551.526.6(261.2/3)

*Dietrich, Günter, **Die Elemente des jährlichen Ganges der Oberflächentemperatur in der Nord- und Ostsee und den angrenzenden Gewässern.** [The elements of the annual variation of surface temperature in the North Sea and Baltic and neighboring waters.] *Deutsche Hydrographische Zeitschrift,* 6(2):49–64, **1953.** 2 figs., 5 charts, 8 tables, 20 refs. German, English and French summaries p. 49. **DWB**—Numerous observations of surface temperature at lightships and coastal stations are tabulated and analyzed. Tables show diurnal range and monthly means, mean departures and 4–5 day variability for the period 1906–1938, and correlations between different stations. The first 3 annual harmonic terms are calculated and their relations shown in 5 isoline charts. *Subject Headings:* **1. Sea temperatures 2. Baltic Sea 3. North Sea.**—*C.E.P.B.*

PRESSURE AND WIND

PRESSURE

See also: **Temp. and pressure variations in troposphere** (Dady), 5.3–198.

5.3–207 551.541:551.558.21

Scorer, R. S., **Pressure-fluctuations in mountain eddies.** *Weather,* 8(11):343–345, Nov. **1953.** figs. **MH-BH**—Several quick-run barograph and thermograph records at Great Langdale, Westmoreland on Jan. 31–Feb. 1, 1953, are illustrated, showing rapid fluctuations. The strong gusty wind was known by its sound to fluctuate in sympathy. The hygrograph

showed no corresponding changes and the fluctuations are attributed to eddies caused by the mountains. *Subject Headings:* **1. Microbarometric oscillations 2. Eddies.**—*C.E.P.B.*

5.3–208 551.541

Sellick, N. P., **Barograph antics.** *Weather*, 8(7):223, July **1953.** fig. **MH-BH**—Reproduction of barograms for June 18, 1940, in Limpopo valley (22°S, 29°E) showing marked rapid fluctuations of 2–3 mb in a few minutes. *Subject Headings:* **1. Microbarometric oscillations 2. Rhodesia.**—*C.E.P.B.*

5.3–209 551.541:551.515.41

Williams, Bryan A., **Barograph antics.** *Weather*, 8(1):31, Jan. **1953. MH-BH**—Describes marked pressure jumps during a thunderstorm at Bristol, July 5, 1952. *Subject Headings:* **1. Microbarometric oscillations 2. Thunderstorm structure 3. Bristol, England.**—*C.E.P.B.*

5.3–210 551.543:550.342

Ewing, Maurice and Press, Frank (*Lamont Geological Obs., Columbia Univ., N. Y.*), **Further study of atmospheric pressure fluctuations recorded on seismographs.** *American Geophysical Union, Transactions*, 34(1):95–100, Feb. **1953.** 6 figs., 5 refs. Also: Columbia University. Lamont Geological Observatory, Contract AF 19(122)-441, Report No. 19, Technical Report on Seismology, No. 20, March **1952.** 10 p. 6 figs., 7 refs. **DWB, MH-BH**—Some "microseismic" oscillations, long believed to be the result of an energy transfer between atmosphere and earth, can be eliminated, improving the performance of a long period vertical seismograph, compensating the seismograph for pressure fluctuations. A sensitive microbarovariograph is described, recording pressure fluctuations in the period range 20 to 2000 sec. Cylinders of identical volume are placed on each end of balance, one sealed, the other with a small opening. The instrument records air density variations, from which pressure variations can be computed by means of a calibration curve. *Subject Headings:* **1. Microbarographs 2. Microseisms 3. Pressure fluctuations.**—*A.A.*

5.3–211 551.543(02, 99)

Mironovitch, Valéry, **Cartes isobariques moyennes saisonnières dans l'hemisphère austral.** [Mean seasonal isobaric charts in the Southern Hemisphere.] *Académie des Sciences, Paris, Comptes Rendus*, 236(6):623–625, Feb. 9, **1953.** 2 figs. **DWB**—These are the first published average seasonal pressure maps for the Antarctic regions (extended over the whole Southern Hemisphere), 15 years after MEINARDUS presented his annual maps. The maps, averaged over three months, separately for summer and winter are based on a large number of unlisted sources, including unpublished data from recent French and other expeditions. Isobar distance 5 mb; for certain regions 1–3 mb; coverage of tropical areas is still inadequate. *Subject Headings:* **1. Isobaric charts 2. Southern Hemisphere 3. Antarctic Region.**—*A.A.*

WIND AND WIND VARIATIONS

See also: **Eddy diffusion of momentum, water vapor and heat near ground** (Rider), 5.3–11; **Seasonal wind direction frequency data, Hungary** (Kakas), 5.3–49; **Hot wire anemometers for aircraft** (Murgatroyd, James), 5.3–72; **Anemometers for field investigation of fog** (Ishida, Hideo), 5.3–83; **Atmos. turbulence measurement and analysis** (MacCready), 5.3–84; **Fundamentals of boundary layer theory** (Krzywoblocki), 5.3–136; **Meinardus and revision of concepts of atmos. circulation** (Flohn), 5.3–141; **Development and structure of monsoon depressions** (Desai), 5.3–144; Wind velocities **during hurricanes** (Gentry), 5.3–155; **Analysis of winds in typhoon** (Fujita), 5.3–158; **Relation: vertical temp. difference and wind speed near ground, daytime** (Maruyama), 5.3–196; **Hill-wave cirrus** (Ludlam), 5.3–252; **Barometric min. at St. Raphael . . .** (Rougetet), 5.3–281.

5.3–212 551.55:632.4

Thorold, C. A., **Airborne dispersal of *Phytophthora palmivora*, causing Black-pod disease of *Theobroma cacao*.** *Nature*, London, 170(4330):718–719, Oct. 25, **1952.** 2 tables, 9 refs.

DWB—Summary of observations of spread of disease in Nigeria, indicating random air-borne infections from a central source. *Subject Headings:* **1. Cocoa tree blight 2. Air-borne diseases.**—*C.E.P.B.*

5.3–213 551.551:551.554:551.524.4

†*Deacon, E. L., **Vertical profiles of mean wind in the surface layers of the atmosphere.** *Great Britain. Meteorological Office, Geophysical Memoirs*, 11(91), **1953.** 68 p. 33 figs., 20 tables, 53 refs., 27 eqs. M.O. 53 Of. **DWB**—This important paper summarizes measurements of wind profiles 0.5–13.27 m and temperature gradient 0.2–17.1 m above grass at Porton, Wiltshire. With neutral stability (dry adiabatic lapse) results fit PRANDTL's logarithmic law very closely, constants depending on length of grass. Roughness parameter, and drag coefficient at 2 m, are related to grass length. Results are combined with previous work over various surfaces and embodied in diagrams of roughness parameter. Variation of lateral and vertical gustiness is related to friction velocity and distance from surface. Pt. 3 discusses effect of thermal stratification and dependence of speed ratios between different levels on Ri number. Forms of wind speed profiles are tabulated and a generalized relationship derived:

$$u = \frac{u^*}{(1-k\beta)}\left\{\left(\frac{z}{z_0}\right)^{1-\beta} - 1\right\}$$

which becomes logarithmic when β approaches 1. The bearing of the results on eddy viscosity is discussed. The critical Ri number for onset of turbulence between 4 and 0.5 is <1. *Subject Headings:* **1. Wind profiles 2. Wind structure.**—*C.E.P.B.*

5.3–214 551.553.8(261):629.12

Der Kampf um die Rettung des F. D. "N. Ebeling" (23.12.52) im Spiegel des Funktagebuchs F. D. "Saarland." [The fight to save the "N. Ebeling" reflected in the log of the "Saarland."] *Wetterlotse*, No. 55:81–88, April **1953. DWB**—The log from 0730 to 2228 h gives an insight into the exchange of weather information and the organization of a search for a missing vessel. *Subject Headings:* **1. Gales 2. Shipping.**—*C.E.P.B.*

5.3–215 551.553.8:532.593

Rodewald, Martin, **Die Kenterung der "Irene Oldendorff"—eine Warnung vor "Schönwetterstürmen."** [The capsizing of the "Irene Oldendorff"—a warning about fine weather storms.] *Wetterlotse*, No. 43:145–155, Sept. **1952.** 3 figs. **DWB**—Dec. 31, 1951, off the Wester-Ems the ship sank suddenly; all crew lost. A depression (970 mb) lay off Hebrides on 30th. Sky was clear but wind squally (up to 45 km), owing to instability over warm sea. Loss attributed to a "white squall" from west acting against a strong ebb tide. *Subject Headings:* **1. Squalls 2. Marine disasters.**—*C.E.P.B.*

5.3–216 551.553.8(261)

Rodewald, Martin, **Die Nordoststürme vor Nordwestisland.** [The northeast storms off NW Iceland.] *Wetterlotse*, No. 55:88–96, April **1953.** 2 figs. **DWB**—These dangerous storms have increased in intensity in recent years, as shown by a doubling of the NE gradient between Greenland and Iceland in 1949–52 compared with normal. The storm which wrecked the "N. Ebeling" on Dec. 23, 1952, was forecast on evening of Dec. 21 (prebaratic shown). *Subject Heading:* **1. Gales.**—*C.E.P.B.*

5.3–217 551.553.8(261)

Rodewald, Martin, **Sturmreichtum Nordwestisland—Sturmarmut Lofoten.** [Many storms in north-west Iceland, few in Lofoten.] *Wetterlotse*, No. 59:155–159, July **1953.** 2 figs. **DWB**—Mean pressure anomalies 1949 through 1952, associated with NE storms in Denmark Strait (*see* 5.3–216 above) gave fewer westerly winds off N. Norway. *Subject Heading:* **1. Pressure anomalies.**—*C.E.P.B.*

5.3–218 551.553.8:551.515:525.63

§Sneyers, R., **La tempête et le débordement de la mer du 1er février 1953.** [The storm tide of Feb. 1, 1953.] *Ciel et Terre*, 59(3/4):97–108, March/April **1953.** 6 figs., 2 tables,

refs. Also in: *Belgium. Institut Royal Météorologique, Contributions*, No. 11, **1953. MH-BH**—The synoptic situation connected with the storm tide of Feb. 1, 1953, characterized mainly by the eastward displacement of a depression over the North Sea, is described and illustrated with surface weather charts (Jan. 30, 31, Feb. 1), a chart showing positions of the depression center at 6-hour intervals, and a chart of maximum wind velocities in Belgium. Wind directions and velocities are tabulated for six Belgian stations for Jan. 31 and Feb. 1. A statistical review of earlier storm tides is added. *Subject Headings:* **1. Storm tides 2. Belgium.**—*G.T.*

5.3–219 551.554

Calder, K. L., **Note on the derivation of the logarithmic velocity profile.** *Royal Meteorological Society, Quarterly Journal*, 79(339):163–164, Jan. **1953.** 2 refs., 4 eqs. **DWB**—Comments on note by O. Björgum (*see item* 3.4–172, April 1952, *MAB*). *Subject Heading:* **1. Wind profiles.**—*C.E.P.B.*

5.3–220 551.554

Björgum, O., **The derivation of the logarithmic velocity profile.** *Royal Meteorological Society, Quarterly Journal*, 79(340):292–293, April **1953.** 3 refs. **DWB**—Comments on note by K. L. Calder (*see* 5.3–219 above) showing Björgum's derivation of logarithmic velocity profile. *Subject Heading:* **1. Wind profiles.**—*C.E.P.B.*

WIND EFFECTS

See also: **Hydrodynamic effects of gales** (Keulegan), 5.3–4; **Sea ports** (Liashnitskiĭ), 5.3–7; **Snow fences** (Pugh), 5.3–267; **Influence of shelter belt on wind and precip.** (Kreutz), 5.3–291.

5.3–221 551.556:532.593:656.6

§Rodewald, M. and Hebecker, O., **Melanie Schulte.** [MS "Melanie Schulte."] *Wetterlotse*, No. 57:116–127, May **1953.** 4 figs. **DWB**—Summary of inquiry into loss in 2 min of the ship on Dec. 21–22, 1952. Ship was W of Scotland in a vigorous young depression; winds along two possible tracks are set out. Rodewald points out that waves 5–6 m high would have same wave-length as ship and with passage of front across sea would develop with crests of 9–10 m. The ship may have broken in two. Other possibilities are discussed by Hebecker. *Subject Headings:* **1. Wind waves 2. Marine disasters.**—*C.E.P.B.*

5.3–222 551.556:551.463

SHtokman, V. B., **Opredelenie statsionarnykh techeniĭ i polia mass, obuslovlennykh vetrom v baroklinnom more.** [Stationary currents and field of masses due to wind in a baroclinic sea.] *Akademiia Nauk, SSSR, Institut Okeanologii, Trudy*, v. 6:3–48, **1951.** 19 figs., 7 tables, 19 refs., eqs. **DLC**—Comprehensive theoretical study for which the author applied results of previous investigations throughout the world and also his own ideas. The characteristics of lateral currents due to wind are presented in the first part. In Pt. 2 the author analyzes effect of lateral friction in the field of Coriolis force and distribution of density and velocity of flow due to wind for some weather situations. *Subject Heading:* **1. Wind driven currents.**—*N.T.Z.*

5.3–223 551.556:551.465

TSikunov, V. A., **Ob uporiadochennom peremeshivanii v verkhnem sloe moria.** [The regular mixing in the upper layer of the sea.] *Voprosy Geografii, Gidrologiia*, No. 26:235–249, **1951.** 4 figs., refs., 4 eqs. **DLC**—Deals with the formation of long convective cells in the surface layer of the sea and their dependence on wind speed (v) and direction and on the temperature difference water—air ($\Delta\vartheta$). Previous observations from Darwin up to Langmuir are discussed and own observations summarized. (Method used: photographs of the water surface artificially covered by particles.) Distance between strips is about equal to the depth of mixing (to the temperature discontinuity layer). Critical wind speed for the establishment of convective cells >4–5 m sec^{-1}; general condition: air cooler than water, but a few exceptions

were observed, perhaps due to cooling by evaporation. Basic theoretical problems outlined. *Subject Headings:* **1. Ocean-atmosphere interaction 2. Convective cells.**—*A.A.*

5.3–224 551.556:632.6:633.491

White, J. H., **Wind-borne dispersal of potato-root eelworm.** *Nature*, London, 172(4380): 686–687, Oct. 10, **1953.** table, 4 refs. **DWB**—Traps facing SW were placed 1–4 ft above ground on edge of a field of light soil in Lincolnshire moderately infested with *Heterodera rostochiensis*. During a storm on March 28, 1953, the catch was equivalent to at least 5180 viable cysts over a front 15 in. wide and 4 ft 6 in. high, mostly below 18 in. Thus, in dusty soils wind is very effective in local distribution. *Subject Headings:* **1. Wind effects 2. Potato pests.**—*C.E.P.B.*

5.3–225 551.556.1:634.94

Steven, H. M., **Wind and the forest.** *Weather*, 8(6):169–174, June **1953.** 2 figs., 7 refs. **MH-BH**—Account of damage to Scottish forests by storm of Jan. 30–Feb. 1, 1953, when gusts exceeding 92 m.p.h. were recorded (anemogram reproduced): 3½–4 million trees (40 million cu ft) blown down. *Subject Heading:* **1. Wind damage to forests.**—*C.E.P.B.*

UPPER AIR WINDS

See also: **Travelling disturbances in ionosphere** (Somayajulu, Rao, B. and Rao, E.), 5.3–39; **Upper troposphere, lower stratosphere near jet streams** (Murray), 5.3–143.

5.3–226 551.557:551.524.7(798)

Crary, A. P., **Annual variations of upper air winds and temperatures in Alaska from acoustical measurements.** *Journal of Meteorology*, 10(5):380–389, Oct. **1953.** 4 figs., 3 tables, 7 refs. **MH-BH**—Acoustical soundings at College, Alaska, 1950–51, are tabulated. Upper winds at 10–15 km averaged easterly 5–10 m/s in summer, variable 20–35 m/s in other months. At 50 km they were generally southerly in all months. Temperature shows a maximum (22–36°C) about 47 km in summer, and probably below 10°C at 50–60 km in winter. *Subject Headings:* **1. Acoustical sounding 2. Upper air temperatures 3. Upper air winds 4. Alaska.**—*C.E.P.B.*

5.3–227 551.557:551.590.25(789)

Whipple, Fred L., **Winds in the upper atmosphere by meteor-train photography.** *Journal of Meteorology*, 10(5):390–392, Oct. **1953.** fig., table. **MH-BH**—Multiple photos of a meteor train over New Mexico on Dec. 23, 1951, with a Baker Super-Schmidt Meteor Camera, triangulated by stationary cameras, gave estimates of velocity normal to line of trail. Results show maxima of 80 mi/hr from N.W. at 88 and 94 km and 30 mi/hr from S.E. at 87 and 92 km. *Subject Headings:* **1. Upper air winds 2. Meteor trail photography 3. New Mexico.**—*C.E.P.B.*

VERTICAL CURRENTS

See also: **New method for measuring vertical air currents** (Barratt, Browne), 5.3–36; **Pressure fluctuations in mountain eddies** (Scorer), 5.3–207

5.3–228 551.558.1:629.135.1

California. University at Los Angeles. Dept. of Meteorology, **Report on the activities of the Southern California Soaring Association, Inc., in Phase I of the Sierra Wave Project, Oct. 1950 to Oct. 1951.** Contract AF19(122)-263, [Report], Nov. **1951.** 16 p. 8 figs., append. **DWB**—Most of the report consists of technical information about soaring test flights and assistance during ground operations. An appendix is given in narrative form about meteorological observations, obtained in flight. *Subject Headings:* **1. Sailplane test flights**

2. Aeronautical meteorology. I. Southern California. Soaring Association, Inc. II. Klemperer, W. B. III. Saudek, Victor Mead IV. Eldredge, R. C. V. Contract AF19(122)-263.—*A.A.*

5.3–229 551.558.1:551.576.11:551.515.4

Day, G. J., **Unusually vigorous cumulonimbus cloud over southern England.** *Meteorological Magazine*, London, 82(977):342–344, Nov. **1953.** fig., 3 refs. **MH-BH**—July 1, 1953, a plane at Farnborough was thrown up from 29,000 to 38,500 ft at a rate probably >80 ft/s. Echo tops rose at 2000 ft/min and reached 43,000 ft. Very heavy rain fell to the east over a small sharply limited area. *Subject Headings:* **1. Vertical currents 2. Cumulonimbus clouds.**—*C.E.P.B.*

5.3–230 551.558.1

Deguillaume, M., **Filets atmosphériques ascendants ou descendants.** [Downward and upward currents of air.] *La Météorologie*, 4th Ser., No. 28:161–163, Oct./Dec. **1952. DWB**—A theoretical demonstration of the resulting upward or downward motion of air when the thickness of a layer increases due to the relative decrease in wind speed, or when it decreases due to the relative increase in wind speed. A steady state (no turbulence) is assumed. *Subject Headings:* **1. Relative wind speeds 2. Vertical motion 3. Mechanics of the atmosphere 4. Convergence and divergence.**—*M.R.*

5.3–231 551.558.1:797.5

Great Britain. Royal Meteorological Society and British Gliding Association, **Fair weather cumulus.** *Royal Meteorological Society, Quarterly Journal*, 79(341):420–436, July **1953.** Discussion: A. H. Yates, **Atmospheric convection; the structure of thermals below cloud base,** p. 420–424, 5 figs., 3 refs.; D. G. James, **Fluctuations of temperature below cumulus clouds,** p. 425–428, fig., 3 refs.; Welch, L., **Thermals as seen by glider pilots,** p. 429–430; Ludlam, F. H., **The sub-cloud layer over land,** p. 430–431, 3 figs., ref. Discussion p. 431–436, fig. **DWB**—Yates assembles facts about thermals known to glider pilots: diameter about 1000 ft, upward velocity 0–15 ft/sec, temperature 1–2°C above surrounding air, periodicity 5–15 min, one to each sq. ½ mile. A bubble and wake model is developed for calm and wind and airflow sketched. James discusses traces of rapid temperature fluctuations at 500 ft intervals below a cu; these show: at 500 ft bubbles of all diameters from 200–8000 ft, 1000–2500 ft, bubbles decreasing in size and frequency; at 3000 ft, intense turbulent mixing. Welch describes gliding in thermals and suggests research. Ludlam describes changes of dry and wet lapse rates on entering layer several hundred feet thick below bases of cu in England. A good discussion followed. *Subject Headings:* **1. Thermals 2. Gliding. I. Yates, A. H. II. James, D. G. III. Welch, L. IV. Ludlam, F. H.**—*C.E.P.B.*

5.3–232 551.558.1:551.576.1:551.515

Jones, R. F., **Five flights through a thunderstorm belt.** *Great Britain. Meteorological Research Committee, M.R.P.* 820, June 10, **1953.** 8 p. 5 figs., 2 plates, table, 4 refs. Mimeo. **GB-MO**—Accelerometer, altimeter and temperature records during flights through CuNb clouds are presented in curves and discussed. Up and down currents of 20 ft/sec or more occurred near together in the cloud; in one case an upward speed of 30 ft/sec changed to a downward speed of 23 ft/sec in 750 yards. Outside the cloud down currents may exceed 10 ft/sec but not up currents. Results are correlated with 10 cm radar; biggest gusts all occurred within the echoing part of the cloud. *Subject Headings:* **1. Vertical currents. 2. Cumulonimbus clouds.**—*C.E.P.B.*

5.3–233 551.558.1

Sansom, H. W. and Gross, J., **A strong descending air current at Nairobi.** *Weather*, 8(9):282, Sept. **1953.** table. **MH-BH**—Descending air current of 1000 ft/min observed by radar and radio sonde between 12,000 and 15,000 ft on March 24, 1953. *Subject Headings:* **1. Vertical currents 2. Nairobi, East Africa.**—*C.E.P.B.*

AQUEOUS VAPOR AND HYDROMETEORS

HUMIDITY AND EVAPORATION

See also: **Eddy diffusion of momentum, water vapor and heat near ground** (Rider), 5.3–11; **Waterloss investigations** (U. S. Navy, Electronic Lab.), 5.3–13; **Daylight luminescence, infrared absorption** (Denver Univ.), 5.3–177; **Method for determining amount of solar radiation absorbed by water vapor in atmos.** (Dickson), 5.3–178; **Processes affecting salinity of Irish Sea** (Bowden), 5.3–259; **Humidity factor in air mass analysis** (Ozoray), 5.3–306.

5.3–234 551.571.35

Green, F. H. W., **A remarkable low humidity.** *Weather*, 8(6):182–184, June **1953.** fig. **MH-BH**—At Moor House, Westmoreland (1830 ft), March 1953 had average humidity at 9 h of only 67%. On March 3 it fell to 26% in dry air above a mist layer, and on 6th probably to 8%. Exceptional visibility. *Subject Headings:* **1. Humidity extremes 2. Westmoreland, England.**—*C.E.P.B.*

5.3–235 551.571.7:551.556.1 551.524.4:551.576.1

Kraght, Peter E. (*American Airlines, LaGuardia Field, N. Y.*), **Temperature and moisture gradients under low stratus clouds.** *American Meteorological Society, Bulletin*, 33(10):403–408, Dec. **1952.** fig., 3 tables, 21 refs., 18 eqs. **MH-BH**—The lapse rate of dew point is developed from thermodynamic relations. It is shown to have varied values depending on the flux of water vapor but to have a value of nearly 1.0°F per 1,000 feet for steady state. The lapse rate of temperature is developed after a method suggested by PRIESTLEY and SWINBANK. Approximately 10,000 cases of ceiling heights, temperatures and dew points observed simultaneously are used as a statistical sample to represent an equilibrium state for a layer 1,000 feet or less thick. The results suggest the ratio of the equilibrium lapse rate to the dry adiabatic lapse rate is nearly 0.80. *Subject Headings:* **1. Dew point lapse rate 2. Vertical temperature gradient 3. Stratus clouds.**—*Author's abstract.*

5.3–236 551.571.7

Ashmore, S. E., **Low humidities at high-level stations.** *Weather*, 8(11):353, Nov. **1953. MH-BH**—Note on humidities of 20–25% at stations above 1000 ft in Britain in spring. *Subject Heading:* **1. Upper air humidity.**—*C.E.P.B.*

5.3–237 551.571.7:551.509.54

Neuwirth, R., **Feuchtegehalt der Atmosphäre und Niederschlagsprognose im Zusammenhang mit der Lage des Beobachtungsortes zum planetarischen Ringstrom (Jet Stream).** [Moisture content of the atmosphere and precipitation forecasts in connection with the position of the observation place relative to the planetary ring current (jet stream).] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 6(1):59–77, **1953.** 6 figs., table, 22 refs., 2 eqs. German, English and French summaries p. 59. **MH-BH**—Total humidity kg/m² 850–500 mb is calculated from radiosonde ascents and a synoptic chart drawn (Oct. 24, 1952). This shows relations to cloud and fronts. The largest values tend to occur at the warm edge of the frontal zone or "planetary ring stream" (jet stream). The application to forecasting precipitation amounts is discussed. *Subject Headings:* **1. Upper air humidity 2. Rainfall forecasting.**—*C.E.P.B.*

5.3–238 551.573:551.508.72

†Berger-Landefeldt, U., **Beiträge zur Messung der Evapotranspiration nach dem Austauschverfahren.** [Contribution to the measurement of evapotranspiration by the exchange method.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 5(1):66–102, **1953.** 6 figs., 66 refs., 37 eqs. German, English and French summaries p. 66–67. **MH-BH**—This paper discusses in detail methods of measuring transpiration by weighing, and evapotranspiration (by exchange method). Among problems considered are instrument height above plant tops, effective zero level, nonadiabatic gradients and advection. Author then describes his

own set-up and measurements over lucerne at Berlin-Charlottenburg and shows results in curves of variation 9–18 h. on various days in summer and autumn 1951. Great differences between results of the two methods are attributed to turbulence. *Subject Headings:* **1. Atmometry 2. Evapotranspiration.**—*C.E.P.B.*

CONDENSATION NUCLEI

See also: **Structure of dust-free space, its application** (Yano, Okamoto), 5.3–118; **Visibility and liquid content of cloud** (Neiburger and others), 5.3–312.

5.3–239 551.574.1:536.421

Bigg, E. K., **The supercooling of water.** *Physical Society, Proceedings, Sec. B,* 66(8): No. 404:688–694, Aug. 1, **1953.** 3 figs., 13 refs., 3 eqs. **DWB**—Freezing temperatures of water drops diameter 50μ to 2.5 cm at the interface of two insoluble liquids were measured by thermocouple. Freezing point increased linearly with logarithm of drop diameter. For 1 mm drops it varied from −20 to −28°C, most frequent at −24°C. Rate of cooling has a small but real effect, more rapid cooling giving greater supercooling. The interrelations between freezing point, volume and time are also derived theoretically and found to be consistent with the observations. Earlier experimental data are compared and discussed. *Subject Heading:* **1. Supercooled water.**—*C.E.P.B.*

5.3–240 551.574.1:536.42

Bigg, E. K., **The formation of atmospheric ice crystals by the freezing of droplets.** *Royal Meteorological Society, Quarterly Journal,* 79(342):510–519, Oct. **1953.** 2 figs., 4 tables, 22 refs., 3 eqs. **DWB**—Referring to his paper "The supercooling of water" (*see* 5.3–239 above) author examines expansion chamber experiments of FINDEISEN and SCHULZ and concludes that all the main features can be explained without ice nuclei. The processes of ice formation in cirrus, stratus and cumulus are discussed, and it is concluded that, especially below −20°C, freezing nuclei may be less important than previously supposed. Where frequency of ice crystals is excessive, they may be due to contamination by industrial smoke. *Subject Heading:* **1. Freezing of cloud droplets.**—*C.E.P.B.*

5.3–241 551.574.1

Browne, I. C. and Wexler, R., **The collection efficiency of ice crystals.** *Royal Meteorological Society, Quarterly Journal,* 79(342):549, Oct. **1953. DWB**—Comments on discussion of paper by R. WEXLER, "Theory of radar upper band" (*see item* 3.10–36, Oct. 1952, *MAB*) and reply by WEXLER. *Subject Headings:* **1. Bright band echoes 2. Radar analysis of precipitation.**—*C.E.P.B.*

5.3–242 551.574.1:551.576.1

*Brun, Rinaldo J. and Mergler, Harry W., **Impingement of water droplets on a cylinder in an incompressible flow field and evaluation of rotating multicylinder method for measurement of droplet-size distribution, volume-median droplet size, and liquid-water content in clouds.** *U. S. NACA, Technical Note,* 2904, March **1953.** 71 p. 19 figs. (2 fold. in pocket), 4 tables, 15 refs., eqs. **DWB**—The trajectories of water droplets in an incompressible flow field around a cylinder were calculated with a mechanical analog. The collection efficiency, the area of droplet impingement on the cylinder, and the rate of droplet impingement were determined from the trajectories. An evaluation of the rotating multicylinder method for the measurement of droplet-size distribution, volume-median droplet size, and liquid-water content was made based on the results of the trajectory calculations. *Subject Headings:* **1. Drop size distribution 2. Liquid water content of clouds 3. Impingement of drops.**—*NACA-TN2904.*

5.3–243 551.574.1:551.509.67

†Byers, Horace R. (*Chicago Univ.*), **Rational approach to rain making.** *Indian Academy of Sciences, Bangalore, Proceedings, Sec. A.,* 37(2):237–247, **1953.** 3 figs., table, refs. p. 246–247. Abstracted from reprint. **DWB**—A review of the latest scientific experiments in artificial rain making industry and a survey of the principles of cloud physics involved. The two

prevailing theories of precipitation formation in clouds; the BERGERON theory of ice crystal nucleation in supercooled portions of a cloud and the theory based on nucleation by oversize raindrops which can account for rain from nonfreezing clouds are especially emphasized. Tests to be conducted by the U. S. Weather Bureau in southwestern Washington State (and adjacent Oregon) with homogeneous rainfall patterns, and possible tests with nonhomogeneous (convective) type rainfall, are outlined critically. *Subject Headings:* **1. Artificial precipitation 2. Cloud physics 3. Cloud seeding.**—*M.R.*

5.3–244 551.574.1

Frenkel', IA. I., **O fotokhimicheskom mekhanizme vozniknoveniia iader kondensatsii v zemnoĭ atmosfere.** [Photochemical mechanism in the formation of condensation nuclei in the earth's atmosphere.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geofiz.*, No. 2:191–192, **1953.** ref. **DLC**—The hypothesis is proposed that condensation nuclei of water vapor in the atmosphere are produced by the condensation in the upper atmospheric layers of gaseous substances formed in the ozone layer by the action of ultraviolet light from the sun. *Subject Headings:* **1. Condensation nuclei theory 2. Ionosphere.**—*I.L.D.*

5.3–245 551.574.1

Frisch, H. L. and Collins, F. C., **Theoretical investigation of the growth of aerosol particles by diffusion.** Polytechnic Institute of Brooklyn, Contract AF 19(122)-412, Report No. 1, [1952?]. 15 p. refs., 50 eqs. **DWB**—The effect of adiabatic cooling and heating on the growth rate of aerosol droplets is evaluated. The magnitude of the temperature rise at the surface of the droplet due to the liberation of the heat of condensation is obtained and the results of this temperature rise on the growth process are investigated. An error in the previously calculated flux rate for a multiplicity of droplets in the diffusion field has been rectified and the growth rate law obtained for this case. *Subject Headings:* **1. Drop diffusion 2. Condensation nuclei. I. Polytechnic Institute of Brooklyn II. Contract AF 19(122)-412.**—*Authors' abstract.*

FOG

See also: **Fog data, London, Dec. 5–9, 1952** (Stewart), **5.3–62.**

5.3–246 551.575.1

Alaskan ice fogs. *Stanford Research Institute, Stanford, Calif., Research for Industry*, 4(4):11, May **1952.** photo. **DWB**—Describes research being conducted by Stanford Research Institute on ice fogs and other Arctic winter problems of engineering and operation in the vicinity of Fairbanks, Alaska. *Subject Headings:* **1. Ice fog 2. Arctic research 3. Fairbanks, Alaska.**—*M.R.*

5.3–247 551.575.1:551.588.6

Fukutomi, Takahara, **A theoretical study on the changes of liquid water contents of intruding stationary sea fogs due to the capturing action of a forest in the coastal region.** (In: Sapporo, Japan. Hokkaido University. Institute of Low Temperature Science, **Studies on fogs in relation to fog-preventing forest. 1953.** p. 81–104. 8 figs., 3 refs., 65 eqs.) **MH-BH**—The author discusses theoretically the changes of atmospheric liquid water content and atmospheric temperature caused by the capturing action of leaves, branches, by air turbulence and by fall of fog particles as a result of gravity, for the case of a stationary sea fog of finite thickness carried perpendicularly into a coastal forest zone by a horizontal wind. Equations for total water content and heat content are developed on the assumptions that: 1) the air is always saturated; 2) the air above the forest is divided into two layers; in the lower layer the fog water contents and air temperature are kept constant in the vertical direction by the turbulence caused by the forest; in the upper layer the air is less constant and has a constant eddy diffusivity equal to that of the intruding air mass; 3) wind velocity constant in both layers and 4) fog particles are all of the same size and have the same eddy diffusivity as the air and water vapor. An example of the application of these equations to a specific case is given. *Subject Headings:* **1. Advection sea fog 2. Water content of fog 3. Forest influences.**—*I.L.D.*

5.3–248 551.575.1/2

Yoshida, Zyungo, **A theoretical study on the distribution of fog density in a forest.** (In: Sapporo, Japan. Hokkaido University. Institute of Low Temperature Science, **Studies on fogs in relation to fog-preventing forest. 1953.** p. 105–112. 3 figs., 2 refs., 13 eqs.) **MH-BH**—The density distribution of fog particles for an idealized forest (infinitely wide and uniform) is deduced theoretically for conditions characterized by constant wind velocity and constant fog density. The equation for fog density at a given point in the forest is developed on the assumption that the vertical motion of a fog particle caused by air turbulence in the forest can be expressed in terms of "one dimensional random walk." *Subject Headings:* **1. Advection sea fog 2. Fog density.**—*I.L.D.*

5.3–249 551.575.36

Cleaver, W. W. and Ratcliffe, R. A. S., **Fog investigation at Wellesbourne Mountford.** *Meteorological Magazine*, London, 82(977):335–336, Nov. **1953.** fig., 2 refs. **MH-BH**—Diurnal variation of fog frequency in autumn and winter, at this station in the Avon Valley surrounded by low hills, is graphed. The frequent fog is due to drainage of cold air into the valley and to the wet clay soil. *Subject Headings:* **1. Fog frequencies 2. Avon Valley, England.**—*C.E.P.B.*

5.3–250 551.575.5(42):551.510.42

Bonacina, L. C. W., **An estimation of the great London fog of 5–8 December 1952.** *Weather*, 8(11):333–334, Nov. **1953.** Meetham, A. R., **Localized pockets or one blanket?** *Ibid.*, p. 334–336. **MH-BH**—Bonacina gives a graphic account of the fog, and suggests that the damage to health was due to localized pockets of poisonous gases from factory chimneys. Meetham attributes the death-toll largely to heart failure through coughing and vomiting. He doubts the theory of pockets of sufficient concentration to cause death. He raises some problems of smoke fog. *Subject Headings:* **1. Smog 2. Great London fog, Dec. 1952 3. London, England. I. Meetham, A. R.**—*C.E.P.B.*

5.3–251 551.575.5(42)

The great fog. *Smokeless Air*, 86:148–153, Summer **1953.** photo. **DWB**—Discussion of questions raised by the London fog of Dec. 5–8, 1952. (*See item* 4.8–182, Aug. 1953, *MAB.*) Fog was not caused by special industrial processes or new domestic apparatus, nor by radioactivity, fluorine or road traffic. Various other points are discussed. The photo shows Piccadilly Circus in fog. *Subject Headings:* **1. Smog 2. Great London fog, Dec. 1952 3. London, England.**—*C.E.P.B.*

CLOUDS

See also: **Coastal stratus, S. Calif.** (Johnson), 5.3–104; **Objective method of forecasting low clouds** (Kinzebach), 5.3–105; **Unusual CuNb cloud** (Day), 5.3–229; **Five flights through thunderstorm belt** (Jones), 5.3–232; **Temp. and moisture gradients under low stratus** (Kraght), 5.3–235; **Impingement of water droplets . . .** (Brun, Mergler), 5.3–242; **Formation and spread of precip. in convective clouds** (Battan), 5.3–257.

5.3–252 551.576.11:551.551

Ludlam, F. H., **Hill-wave cirrus in India.** *Weather*, 8(8):251, Aug. **1953.** fig. **MH-BH**—Sketch of trailing cirrus in lee of hills. *Subject Headings:* **1. Cirrus clouds 2. Lee waves.**—*C.E.P.B.*

5.3–253 551.576.11

Monteith, J. L. and Wilkins, J. W., **Raising an eyebrow!** *Weather*, 8(9):279–281, Sept. **1953.** 2 photos, ref. **MH-BH**—Description and photos of a curious wavy formation of "eyebrow-shaped" clouds over London, Feb. 19, 1953. Height of first series 15,000 ft, wave length 1.5 mi, velocity 5 kt; second series 13,000 ft, 1.4 mi, 20 kt. Origin of such wave clouds moving with the airstream not clear. *Subject Headings:* **1. Cloud structure 2. London, England.**—*C.E.P.B.*

5.3–254 551.576.11

Noble, R., **Unusual cloud pattern.** *Meteorological Magazine*, London, 82(967):28–29, Jan. **1953.** photo. **MH-BH**—Air photo off Sardinia shows many cloudlets arranged in concentric circles. *Subject Headings:* **1. Cloud formations 2. Sardinia.**—*C.E.P.B.*

5.3–255 551.576.3:551.515.82

Sawyer, J. S. and Dinsdale, F. E., **Cloud in relation to active warm fronts near Bircham Newton during the period, April, 1942 to April, 1946.** *Great Britain. Meteorological Research Committee, M.R.P.* 799, April 23, **1953.** 9 p. 14 tables, ref. Mimeo. **GB-MO**—Clouds observed by airplane were classified and analyzed statistically. Results confirm that cloud increases towards front. There is some increase with increasing frontal slope and with decreasing pressure thickness of frontal zone. Cloud is mainly in warm air more than 200 mi from front but extends down through frontal zone nearer the surface front. Positive relations were found with speed difference between surface and upper wind normal to surface front and with speed differences of warm air and surface front. *Subject Headings:* **1. Cloud variations 2. Warm fronts 3. Bircham Newton, England.**—*C.E.P.B.*

5.3–256 551.576.36

Mikhel', V. M., **További felhörétegek valószinüsége zárt felhötakaró felett.** [Probability of the existence of additional cloud layers over a closed cloud cover.] *Időjárás*, 56(1/4):81–85, Jan./April **1952.** table. Shortened trans. of an article published in the Jan. 1948 issue of *Meteorologiia i Gidrologiia* (translator: Hille, Alfréd). **DLC**—Visual cloud observation data obtained in flight over Germany at 8 locations (1936–1938) are analyzed as to the probability of the occurrence of double or multiple cloud layers. The results are tabulated for winter and summer up to 5 km altitude, with distinction between the different cloud types. *Subject Headings:* **1. Multiple cloud layers 2. Cloud frequencies 3. Translations 4. Germany. I. Hille, Alfréd** (*trans.*).—*G.T.*

PRECIPITATION

See also: **Amplitude distribution function for radar precip. echoes** (Austin), 5.3–40; **Radar observations of rain** (Day), 5.3–41; **Surface precip. intensity study by radar** (Farnsworth, others), 5.3–42; **Errors in radar measurement of rainfall** (Hitschfeld, Berdan), 5.3–43; **"Upper bands" in vertical structure of rain echoes** (Lhermitte), 5.3–44; **Bulletin of daily rainfall, 1951, Zanzibar** (E. Africa High Commission, Met. Dept.), 5.3–55; **Structure of precip. areas of N. American cyclones** (Schulte-Vennbur), 5.3–145; **Rain distribution in tropical storms** (Ramage, Hughes), 5.3–159; **Correlation: temp. and precip. anomalies, winter, N. Hemis.** (Krames), 5.3–182; **Hydromet. of Koyna catchment** (Pramanik, Rao), 5.3–270; **Chromospheric flares and daily precip., Prague** (Krivitsky), 5.3–309.

5.3–257 551.577.11:551.576.1

Battan, Louis J., **Observations on the formation and spread of precipitation in convective clouds.** *Journal of Meteorology*, 10(5):311–324, Oct. **1953.** 12 figs., 5 tables, 36 refs. **MH-BH**—Radar data in Ohio from the Thunderstorm Project in summer 1947 are used to study the formation of precipitation in all-water convective clouds. It is found that nearly 60% of tops of echoes first appeared at temperatures above 0°C, the contours of echo intensity extending upwards with time. It is shown that in middle latitudes precipitation is frequently initiated by a process involving only liquid droplets formed on condensation nuclei. *Subject Headings:* **1. Precipitation formation 2. Cumulus clouds.**—*C.E.P.B.*

5.3–258 551.577.2(42):551.577.3(42)

Ashmore S. E. and Reynolds, G., **Rainfall at Bidston, 1867–1951.** *Royal Meteorological Society, Quarterly Journal*, 79(341):418, July **1953.** **DWB**—Comment and reply on G. Reynolds' "Rainfall at Bidston 1867–1951" (*see item* 4.7–158, July 1953, *MAB*). *Subject Headings:* **1. Rainfall data 2. Rainfall variations 3. Bidston, England.**—*C.E.P.B.*

5.3–259 551.577.2:551.573:551.464(261)

*Bowden, K. F., **Processes affecting the salinity of the Irish Sea.** *Royal Astronomical Society, Monthly Notices, Geophysical Supplement*, 6(2):63–90, Oct. **1950.** 7 figs., tables, refs. p. 87, eqs. **DWB**—The rainfall in the Irish Sea is estimated from the average rainfall in the northern Part of the Irish Sea as shown on GLASSPOOLE's maps, extrapolated seasonally to the central and southern portion of the Irish Sea by using the seasonal ratio for the eight coastal stations in those regions. Evaporation is calculated by using mean monthly sea surface temperatures at Port Erin Bay and mean air-sea temperature difference and relative humidities furnished by the Meteorological Office for sub-areas of the Irish Sea (relative humidity of 86% calculated for Atlantic Ocean west of Ireland was used for Irish Sea). A coefficient k of .108 was thus calculated, which agrees exactly with SVERDRUP's. Tables give values (for each month) of precipitation, wind, humidity, temperature, salinity, runoff, etc. which were used in this outstanding paper. *Subject Headings:* **1. Energy exchange sea-atmosphere 2. Hydrologic cycle 3. Precipitation—evaporation (P-E) 4. Salinity 5. Irish Sea.**—*M.R.*

5.3–260 551.577.2(73)

Causey, Obie Y. (*W.B. Airport Station, Atlanta, Ga.*), **The distribution of summer showers over small areas.** *Monthly Weather Review*, 81(4):111–114, April **1953.** 2 figs., 5 refs. **MH-BH**—The spacial scattering of summer showers over much of the United States presents many problems to forecasters. The primary purpose of this investigation is to determine the areal distribution, during 24-hour periods, of the occurrence of summer rains over three small areas. The areas selected for study are located near Lincoln, Nebr., Peoria, Ill., and in east central Ohio and are defined by circles of radii of about 35 mi. Precipitation data are taken mostly from the records of cooperative stations over a period of 4 to 6 years, depending upon available records. The analyses of these data are compared with a similar analysis of data for the Atlanta area and it is found that there is little difference between the scattering of summer showers over the Southeast and over the three more northerly areas. *Subject Headings:* **1. Areal rainfall distribution 2. Summer precipitation 3. North Central United States.**—*Author's abstract.*

5.3–261 551.577.2(548.7):33

Farmer, B. H., **Colonization in the dry zone of Ceylon.** *Royal Society of Arts, Journal*, 100(4876):547–564, June 27, **1952.** 2 figs. Discussion p. 560–564. **GB-MO**—The paper describes the attempts at peasant colonization of the northern and eastern two thirds of Ceylon, in relation to a map of mean annual rainfall and block diagrams of monthly median rainfall. Malaria has been overcome but the problems of drought and irregular rainfall remain. *Subject Headings:* **1. Precipitation distribution 2. Ceylon.**—*C.E.P.B.*

SNOW

See also: **Depletion method of estimating solar radiation absorbed by snow** (Miller), 5.3–169; **Effect of accumulation on temp. in snow field** (Benfield), 5.3–202; **Frost penetration in soils influenced by depth of snow . . .** (Bay, others), 5.3–203.

5.3–262 551.578.46(410)

Hawke, E. L. and Champion, D. L., **Report on the snow survey of Great Britain for the season 1951–1952.** *Journal of Glaciology*, 2(13):219–228, April **1953.** 4 figs., table. **GB-MO**—A table and diagrams give for Oct. 1951–May 1952, for numerous places, numbers of days with snowfall and snow cover and depth, and variation of snow depth with height on mountains, and snowfall on coastal waters. *Subject Headings:* **1. Snow cover 2. Great Britain.**—*C.E.P.B.*

5.3–263 551.578.46:551.521.2

*Himmel, James M., **Radiation heat exchange between the snowpack and its environment.** U. S. Corps of Engineers, Project CW-171, Technical Bulletin No. 12, Sept. 1, **1950.** 10+p. 6+ figs., 3+ tables, 5 refs. **DWB**—Data on net long wave radiation exchange between snow-

pack and its environment under various conditions of weather and forest cover, as obtained at the Central Sierra Snow Laboratory in 1950, are tabulated, analyzed and graphically represented. Satisfactory agreement is found between observed values and values computed according to the cosine law and the Stefan-Boltzmann law. *Subject Headings:* **1. Radiation heat exchange 2. Snow pack 3. Central Sierra Snow Laboratory. I. Project CW-171 II. U. S. Corps of Engineers.**—*G.T.*

5.3–264 551.578.46(99)

Loewe, F., **Glaciological work in Terre Adélie in 1951. Preliminary report.** *Journal of Glaciology*, 2(14):248–249, Nov. **1953.** 2 refs. **DLC**—Account of studies of mass and heat economy of the snow surface. On days of heavy blizzards at least 50 tons of fine snow are carried from the ice cap across each meter of coast line. With clear skies net radiation is negative with sun at 25°. Firn temperature at a depth of a few meters was −33.5°C in 69¼°S and increases 1°C with every rise of surface inland by 100 m. *Subject Headings:* **1. Snow cover 2. Adélie Land, Antarctica.**—*C.E.P.B.*

5.3–265 551.578.46

Müller, Hans Gerhard, **Zur Wärmebilanz der Schneedecke.** [On the heat balance of the snow cover.] *Meteorologische Rundschau*, 6(7/8):140–143, July/Aug. **1953.** fig., table, 8 refs. **DWB**—On low ground humidity is more important than warmth in melting snow. A grid of temperature, vapor pressure, relative humidity, dew point and equivalent temperature shows a line (through vapor pressure 4.58 mm) below which no melting is possible. *Subject Heading:* **1. Snow melt.**—*C.E.P.B.*

5.3–266 551.578.46

*Myers, Vance A. (*U. S. W.B., Wash., D. C.*) **Frequency variation of snow depths in the Missouri and upper Mississippi Basins.** *Monthly Weather Review*, 81(6):162, June **1953.** tables. **MH-BH**—A table shows depth of snow on ground, exceeded in 10% and 5% of the years on certain dates (from Feb. 10 to April 30) and maximum snow-depth values for these dates. *Subject Headings:* **1. Snow cover 2. Mississippi-Missouri Basin.**—*A.A.*

5.3–267 551.578.46:625.7:551.556

†Pugh, H. Ll. D., **Snow fences.** *Great Britain. Department of Scientific and Industrial Research, Road Research Board, Technical Paper*, No. 19, **1950.** 52 p. 66 figs., 2 plates, 8 tables, 25 refs. **GB-MO**—A detailed summary of the research literature on the formation of snowdrifts by collecting fences. Arrangement should be based on local studies; staggering, etc. is illustrated. Experimental work summarized includes: E. A. FINNEY (Chicago, models in wind tunnel), NØKKENTVED (Denmark, wind tunnel and full scale), Hallberg (Sweden, streamers to give stream lines) and work done in Germany and Derbyshire. Conclusions are that open fences of about 50% density are best (except where space is limited) with a gap at base; German results give length of drift (ft) as $(36+5h)/k$, where h is height (ft), k is approximately $0.3+0.014d$, where d is density in percent; for $d=50$, $k=1$. An Appendix describes mechanics of snow drifting over fences, mounds and cuttings. *Subject Headings:* **1. Atmospheric turbulence 2. Snow drifts 3. Snow fences.**—*C.E.P.B.*

HYDROMETEOROLOGY

See also: **Hydrologic research in arid and semi-arid regions, India, Pakistan** (Dhir), 5.3–284.

5.3–268 551.579:91

Ioganson, V. E., **O gidrologicheskom raĭonirovanii SSSR.** [Hydrological regionalization of the U.S.S.R.] *Voprosy Geografii, Gidrologiia*, No. 26:73–79, **1951.** 2 figs., refs. **DLC**—Author presents a literature survey of methods used for dividing the Soviet Union in hydrological regions and proposes to use for this purpose the ratio r=evapotranspiration/runoff. Maps of r with forest zones presented for the European part. $r<1$—runoff zone; $1<r<3$—intermediate zone; $r>3$—evaporation zone. Isoline $r=1$ lies on 60°N; $r=3$ on 53°N (roughly

coincides with the southern limit of forests). Further sub-regions are established on the basis of the seasonal distribution of runoff. *Subject Headings:* **1. Hydrologic regions 2. Evapotranspiration 3. U.S.S.R.**—*A.A.*

5.3–269 551.579:628.13

Pleshkov, IA. F., **Vliianie gidrologicheskikh izmereniĭ i oshibok na otdachu vodokhranilishch.** [Influence of hydrological changes and errors on yield from reservoirs.] *Problemy Regulirovaniia Rechnogo Stoka*, Moscow, v. 5:239–261, **1952.** figs., 5 tables, 3 refs., eqs. **DLC**—Discusses effect of errors in the assumed rate of runoff and its seasonal distribution on the practical use of water reservoirs. Further, the possibility of changes in the hydrological cycle due to natural or artificial causes is analyzed. A set of tables facilitates the numerical evaluation of errors. *Subject Headings:* **1. Water reservoirs 2. Hydrologic cycle.**—*A.A.*

5.3–270 551.579:551.577.37:551.582.2(54)

*Pramanik, Sushil Kumar and Rao, K. Nagabhushana, **Hydrometeorology of Koyna catchment.** *India. Meteorological Dept., Memoirs*, 29(4), **1952.** 174 p. 4 figs., 28 tables, 4 refs. **DWB**—In connection with a proposed dam construction, all available information from climatological observations was summarized and compared with hydrometric data from 1907–26. Monthly rainfall means for each year are given for 5 stations including the mountain observatory Mahabaleshvar (4534 ft), where the period 1861–1949 is covered. Usual climatic data for this station are given in detail, including also a list of heavy rains and mean hourly rainfall. Rainfall over the Koyna catchment is computed for each monsoon day of the period 1907–26, as well as annual runoff for 89 years, derived from rainfall observations. Frequency distribution of rainfall studied for periods of 1–5 days, months and years. Relation between annual runoff and precipitation is $R=0.844P+18.20''$. The high runoff ratio (.92) indicates a possible underestimation of the rainfall over the catchment. *Subject Headings:* **1. Hydrologic cycle 2. Rainfall intensities 3. Climatic data 4. Catchment basins 5. Mahabaleshvar Observatory, India 6. Koyna, India.**—*A.A.*

5.3–271 551.579:631.43

Ryzhov, S. N., **O rabotakh F. E. Koliaseva po vodnomu rezhimu pochv.** [Works of F. E. Koliasev on water regime of soils.] *Pochvovedenie*, Moscow, No. 1:72–76, **1953.** 4 tables. **DLC**—Koliasev, the leader of the Soil Moisture Laboratory of the Institute for Physical Agronomy, published a series of papers on soil moisture and evaporation from soil which are severely criticized in this paper. Experimental measures on the movement of soil moisture are analyzed and found to be inadequate. *Subject Headings:* **1. Soil moisture 2. Agricultural meteorology 3. Critical reviews 4. Koliasev, F. E.**—*A.A.*

5.3–272 551.579:551.584.41(774)

*Smith, James L. and Crabb, George A., Jr., **Comparative analysis of hydrographs from similar storms on a watershed under timbered and clear-cut conditions.** *Michigan Agricultural Experiment Station, Quarterly Bulletin*, 35(4):489–502, May **1953.** 5 figs., 2 tables. **DA**—This paper is intended as a preliminary analysis of the effect of soil cover on runoff after storms. The two storms produced surface runoff on the cleared watershed even with intensities less than 1 in. per hour which had been almost completely retained when the watershed was still covered with timber. *Subject Headings:* **1. Surface runoff 2. Vegetation influences 3. East Lansing, Mich.**—*G.T.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

5.3–273 551.58:001

Bacsó, Nándor, **Meggondolások az idö, idöjárás és éghajlat fogalmáról.** [Contribution to the definition of weather, weather conditions and climate.] *Idójárás*, 56(1/4):50–55,

Jan./April 1952. **DLC**—The problem of finding a brief yet accurate definition of "climate" is discussed. The author defines climate as a derivative of the concept "weather." He also reviews similar definitions of several authorities. Most of these definitions, the author states, are subject to two errors. The first is to consider climate as a mere average of weather conditions, without accounting for extreme values and other factors. The second current mistake is to consider climate in relation to a finite period. According to the author's definition "climate is the totality of all past and future weather developments at a given place." *Subject Headings:* **1. Climatology 2. Definitions.**—*G.T.*

5.3–274 551.58:06

International Meteorological Organization. Commission on Climatology. Sub-Commission on Applied Climatology, **Internal Bulletin, No. 1, 1951.** 35 p. Title-page in French and English. Articles in French or English. **DLC**—As an introductory part to this *Bulletin*, members of the Commission on Climatology are listed, purposes of the *Bulletin* are indicated, form in which contributions should be submitted is specified and the program of the Sub-Commission on Applied Climatology is outlined. This issue contains the following brief contributions: Brooks, C. E. P., "Application of climatology in Britain"; Sanson, J., "Renseignements climatologiques demandés le plus fréquemment à la Section Française de Climatologie" [Climatological information most frequently sought from the French Climatological Section]; Connor, A. J., "Notes on inquiries for climatological information from industries and professions in Canada"; Burgos, J. J., "A cryokindynoscopic index useful in agroclimatic research"; Gregor, A., "Attempt of an exposition—respectively microclimatical—classification"; and an article (in French) on a definition and classification of fields common to climatology and agricultural meteorology. The *Bulletin* is a sample prepared by CONTRERAS ARIAS to serve as a basis for a continuing publication on Applied Climatology. The CCl in March 1953 resolved to publish a quarterly *Internal Bulletin* for the entire Commission under a new title "Forum of CCl." This new bulletin, when it appears, will supersede the present bulletin. *Subject Headings:* **1. Serial publications 2. Applied climatology 3. IMO. Climatological Commission. I. Brooks, C. E. P. II. Sanson, J. III. Connor, A. J. IV. Burgos, J. J. V. Gregor, A.**—*G.T.*

5.3–275 551.58

Khromov, S. P., **Klimat, makroklimat, mestnyĭ klimat, mikroklimat.** [Climate, macroclimate, local climate, microclimate.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 84(3):289–298, May/June **1952.** 8 refs. **DLC**—The author reviews critically the major concepts of climate prevailing in the 19th and 20th centuries, especially in the Soviet Union. The inadequacies of such concepts which regard climate as the general state of the atmosphere, average state of the atmosphere, a characteristic weather regime extending over a period of years or as an atmospheric process, are pointed out. The author analyzes the climate forming processes, namely radiant energy balance, atmospheric circulation and moisture balance which are constituted by the meteorological variables and supplements the processes with geographic factors of climate such as latitude, height above sea level and properties of underlying surface and also with human activity. S. A. SAPOZHNIKOVA's concepts on microclimate are analyzed and the author presents his own. Macroclimate is defined as the climate of a geographical region or zone; local climate is a subdivision within the former and is based upon data from individual meteorological stations; microclimate is concerned with the climate within 2 meters above the ground. *Subject Headings:* **1. Climate 2. Macroclimate 3. Microclimate 4. Definitions.**—*I.L.D.*

5.3–276 551.58(772)

Visher, Stephen Sargent (Indiana Univ.), **Indiana's weather: some extremes and advantages.** *Indiana Academy of Science, Indianapolis, Proceedings*, 62:230–233, **1952,** pub. **1953.** Abstracted from reprint. **DWB**—Extreme values of high and low temperature, snow and rainfall, and averages of sunshine, cloudiness and thunderstorm frequency officially recorded in northern and southern Indiana are listed. On the basis of the figures presented, the author concludes that Indiana has a favorable climate as compared to other parts of the world (a statement which may receive but limited response from the local reader in view of the

ecord high temperature of 116° in July and the record low of −35° in Feb.). *Subject Headings:* **. Climate of Indiana 2. Extreme temperatures 3. Indiana.**—*G.T.*

5.3–277 551.581:72

†Atkinson, G. Anthony (*Dept. Scientific and Ind. Res., Bldg. Res. Station, Garston, England*), **Building in warm climates. A review of the present state of knowledge and research in the Commonwealth.** Paper for the United States Building Research Advisory Board Conference on Housing and Building in Hot Climates, Wash., D. C., Nov. 18–19, 1952. *Garston, England. Building Research Station, Note* No. E394, **1952.** 12 p. 31 refs. Mimeo. Also in: National Research Council, Wash., D. C. Building Research Advisory Board, **Housing and building in hot-humid and hot-dry climates,** Nov. 18–19, 1952, Proceedings, **1953.** p. 66–74. **DWB**—The tropics are divided into the following climatic regions: hot, humid climates; tropical island climates; "Savannah" or Soudan type climates; upland climates; and hot dry or desert climates. The special problems of building design that must be met in each region in order to attain comfort are discussed. *Subject Headings:* **1. Tropical climates 2. Climatic zones 3. Building design.**—*I.L.D.*

5.3–278 551.581 551.582.3

Pietkiewicz, Stanislaw, [Review of a map] **Climats du Monde.** [Climates of the world.] Pub. [1952?]. 3 p. Mimeo. **DWB**—The map is a wall map, scale 1–25,000,000, published at Warsaw Établissements Nationaux d'Éditions Scolaires, 1951. On a single chart, the three basic climatic elements: temperature, precipitation and wind, the pressure maxima and minima and the ocean currents are shown for each season for the world. The typical cyclone tracks and the limits of snow are also represented. Two supplementary charts are inserted above the main chart; one of total annual precip. and one of seasonal precip. The wind aloft distribution, the length of daylight and other astronomical data are also included on the margin. Seasonal differences are indicated by different colors of lines, arrows or hatching. Numerous shades of colors are used to show warm and cold regions. *Subject Headings:* **1. World climatic charts 2. World climate.**—*M.R.*

CLIMATE OF PARTICULAR PLACES

See also: **Centralized hemispherical projects** (van Rooy), 5.3–85; **Hydromet. of Koyna catchment** (Pramanik, Rao), 5.3–270; **World climates** (Pietkiewicz), 5.3–278.

5.3–279 551.582(778):629.13

*Farthing, E. D. (*comp.*) (*TWA, Inc.*), **A statistical correlation of ceiling, visibility, and wind conditions at Kansas City Airport, Kansas City, Missouri. Based on U. S. Weather Bureau hourly observations for the 5-year period 1946–1950, inclusive.** Trans World Airlines, Inc., July 21, **1953.** 18 p. 8 tables, 15 figs. **DWB**—Hourly observations at Kansas City Airport are analyzed to show the seasonal and diurnal wind direction and wind speed variations of specified low ceiling and low visibility conditions. Data are presented in the form of graphs, hodographs, plain and Baillie type wind roses, and in tables. The causes and conclusions are discussed in text. *Subject Headings:* **1. Airways climatic data 2. Airport climatology 3. Kansas City, Mo.**—*M.R.*

5.3–280 551.582(497.1)

*Mladenović, Tešimir, **Klima Zaječara.** [The climate of Zaječar.] *Srpsko Geografsko Drushtvo, Belgrade, Glasnik,* 31(1):3–17, **1951.** 5 figs., 11 tables. In Serbian; French summary p. 15–17. Legends for figs. in French. **DLC**—A picture of climatic conditions prevailing at Zaječar (128 m) in E. Serbia, a rather narrow plain covered mostly with grainfields and some vineyards and woods on its elevated parts, is presented. Data showing extreme and mean ranges of monthly and annual temperature, atmospheric pressure, absolute humidity, frequency, directions and speed of prevailing winds, number of clear and overcast days, precipitation amounts, etc. are presented in tables and graphs. According to KÖPPEN's classification the climate of Zaječar can be defined as "Cfa"—moderately humid with a hot summer similar to the climate of Virginia. *Subject Headings:* **1. Climate of Zaječar 2. Climatic data 3. Zaječar, Yugoslavia.**—*A.M.P.*

5.3–281 551.582(44:262):551.555.9

Rougeter, E., **Le minimum barométrique de Saint-Raphael et le climat du littoral sud-est Méditerranéen.** [The barometric minimum of St. Raphael and the climate of the south-east Mediterranean coast.] *La Météorologie*, 4th Ser. No. 9:71–77, Jan./March **1948.** 3 figs. **DWB**—The favorable climate of the coast near Nice is only partly due to protection given by mountains against the mistral. It is largely due to a circulation round a barometric minimum centered near St. Raphael which gives a counter-current off the sea and some protective summer clouds. The center is just inland by day and off shore by night. *Subject Headings:* **1. Climatic anomalies 2. Atmospheric circulation 3. French Riviera.**—*C.E.P.B.*

5.3–282 551.582(431):629.13

*§Jourdant, F., **Les accés de la vallée de l'Inn pour l'aviation légère.** [The approaches to the Inn Valley for light aviation.] France. Mission Météorologique Française en Allemagne et en Autriche, [n.d.] 111 p. charts, maps, graphs. **DWB**—A beautiful analytical study, wherein the climatic and physiographic factors (orography, föhn winds, pressure, wind, clouds, fog, precipitation, snow, thunderstorms, hail, visibility, temperature and humidity) and the storms of various types (S, SW, W, NW, N, E), good weather types in winter and bad weather types of summer are discussed briefly and illustrated by numerous topographic, synoptic charts, and tabular data for the Tyrol and Vorarlberg regions. This region is subject to 3 types of climate: 1) maritime, 2) continental and 3) Mediterranean. *Subject Headings:* **1. Aeronautical climatology 2. Synoptic climatology 3. Mountain meteorology 4. Orographic influences 5. Inn Valley, Austria. I. France. Mission Météorologique Française en Allemagne et en Autriche.**—*M.R.*

5.3–283 551.582(469)

*Madeira, José António, **As praias da Rocha e do Estoril em confronto climatológico.** [Climatological aspects of the beaches of Rocha and of Estoril.] *Sociedade de Geografia de Lisboa, Buletim*, 70th Ser., No. 4/6:99–125, April/June **1952.** tables, photos. In Portuguese, English summary p. 120. **DWB**—An analysis of all of the available meteorological data for two popular beach resorts in south Portugal—Praia da Rocha and Monte Estoril. The pressure, temperature, insolation, sea water temperatures, solar radiation, humidity, visibility, cloudiness, precipitation, wind and hydrometeors are tabulated by months, illustrative or comparative data extracted and tabulated in the text and comparison made with other beach resorts in Spain, France and England. Thrice-daily observations are used for many elements (9, 15 and 21 h) and monthly or seasonal averages or frequencies presented for most of the elements. It is concluded that these beaches are among the most salubrious seaside resorts in Europe. *Subject Headings:* **1. Climate of Portugal 2. Seaside resort climates 3. Praia da Rocha, Portugal 4. Monte Estoril, Portugal.**—*M.R.*

5.3–284 551.582.3:551.579:016(54)

†Dhir, R. D. (*Central Water and Power Com., India*), **Hydrological research in the arid and semi-arid regions of India and Pakistan.** (In: UNESCO, **Reviews of research on Arid Zone Hydrology. 1953.** p. 96–127. fig., map (in pocket), 263 refs., eqs. **DWB**—A map of annual precipitation and temperature is presented for India and Pakistan. Literature on the climate of these regions is reviewed. The further discussion deals with evaporation, percolation, in great detail with ground water and, finally, with experiments in artificial rainfall. The extensive bibliography is limited to papers published in English. *Subject Headings:* **1. Hydrologic bibliographies 2. Climatic charts 3. Arid zone research 4. Artificial precipitation 5. India. 6. Pakistan.**—*A.A.*

CLIMATIC CHANGES

See also: **Glacier variations, climatic fluctuations** (Ahlmann), 5.3–1.

5.3–285 551.583:551.590.2

Höiland, Einar, **Klimasvingninger og mulige årsaker til dem.** [Climatic fluctuations and their possible causes.] *Naturen*, 77(2):34–51, **1953.** 2 figs. **DLC**—The climatic fluctuations of earlier times and the possible causes of the present ones may be sought in the earth's topography and/or in the variation of solar radiation. Whether the "climatic im

provement" period is over and a "climatic worsening" has begun, is discussed along with the different theories of climatic change suggested by WEGENER, MILANKOVICH, SIMPSON and WILLETT. *Subject Headings:* **1. Climatic changes 2. Solar influences.**—*W.N.*

5.3–286 551.583

Judson, Sheldon (*Wisconsin Univ.*), **Arroyos.** *Scientific American*, 187(6):71–76, Dec. **1952.** 2 figs. **DWB**—The rainfall pattern in the Southwest was apparently different during the last half of the 19th century than it was immediately before or after. This started a cycle of erosion, which was aggravated by the overgrazing of that period. Such cycles have occurred before man could have been a possible factor. Thus, such artificial influences as grazing are considered to be of a minor importance in the formation of the deep, dry gullies known as arroyos. *Subject Headings:* **1. Climatic changes 2. Arroyos 3. Grazing effects 4. Southwestern United States.**—*M.R.*

5.3–287 551.583:551.588.7(43)

Kaempfert, Wolfgang, **Stadtklima-Änderung an der Meteo-Station Trier.** [Change in the urban climate at Trier meteorological station.] *Germany. Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten*, 2:32–36, **1950.** 6 figs., 4 tables, eqs., 4 refs. French summary p. 36. **DLC**—A curve of annual mean temperature constructed according to the method of overlapping averages is presented for the meteorological station Trier (1904–1938). The curve shows a definite gradual warming tendency. Similar data for the cities Frankfurt a.M. and Kleve fail to reveal a comparable warming trend. It follows that the warming in Trier must be caused by some local factor. After eliminating several possible factors the author gives obstruction to mountain winds by buildings as the cause of the observed warming. *Subject Headings:* **1. Urban climates 2. Urban influences 3. Trier, Germany.**—*G.T.*

5.3–288 551.583.13

Dines, J. S., **A seven-day weather recurrence?** *Weather*, 8(9):286, Sept. **1953. MH-BH**—Argues that supposed 7-day cycle is illusory and due to popular interest in week-end weather. *Subject Heading:* **1. Periodicities.**—*C.E.P.B.*

5.3–289 551.583.2:551.311.12(56)

Erinc, Sirri (*Univ. of Istanbul*), **Glacial evidences of the climatic variations in Turkey.** *Geografiska Annaler*, 39(1/2):89–98, **1952.** 8 figs., 11 refs. **DWB**—The three best known glacial regions in Turkey are the Erciyer glacier, the glaciers of the Cilo region and the glaciers of the eastern Pontic Mountains. They are described with the aid of diagrams and photographs for the purpose of determining the occurrence of climatic variations. The general trend consists of general shrinkage interrupted by phases of reexpansion. The rate of shrinkage was slower up to 1930's and later it became faster. Moraines deposited during the Postglacial expansion phases cover the Pleistocene glacial deposits. "For such embryonic glaciers it means that these glaciers were regenerated in the Postglacial epoch and that they are not the direct survivors of the Pleistocene glaciers. Thus it becomes evident that in a colder and perhaps more humid stage of the Postglacial epoch the glaciers covered an area approximately two times larger that they now cover in Turkey." *Subject Headings:* **1. Glacial ablation 2. Turkey.**—*I.L.D.*

MICROCLIMATOLOGY

See also: **Seasonal wind direction frequency data, Hungary** (Kakas), 5.3–49; **Biram's air meter** (Casella, C. F. and Co., Ltd.), 5.3–71; **Frost penetration in soils influenced by depth of snow . . .** (Bay, others), 5.3–203; **Comparative analysis of hydrographs under timbered and clear-cut conditions** (Smith, Crabb), 5.3–272.

5.3–290 551.584:016:8

†Geiger, Rudolf, **Mikroklimatologie.** [Microclimatology.] *FIAT Review of German Science*, 1939–1946, *Geography*, Pt. I:70–82, **1948.** 136 refs. **DLC**—German literature (1939–1945) on microclimatology is presented in 136 bibliographic entries (arranged alphabetically) and brief annotations. The annotations are arranged in 8 sections (comprehensive

works; general principles; soil climate; the atmospheric layer adjacent to water and snow; effect of profile; effect of vegetation, excluding forest; forest climate; relations of man to climate). *Subject Headings:* **1. Microclimatological bibliographies 2. German meteorological reviews.**—*G.T.*

5.3–291 551.584.41:551.556.2

Kreutz, W., **Einfluss eines Windschutzobjektes in Schwetzingen auf Wind und Niederschlag während eines Jahres.** [Influence of wind shelter in Schwetzingen (Baden) on wind and precipitation through a year.] *Meteorologische Rundschau*, 6(5/6):91–94, May/June, **1953.** 5 figs., 2 tables. **DWB**—In Schwetzinger Castle park near Giessen observations were made with cup anemometers 1½ m above ground and with rain gages at 5 points in a garden 250×90 m surrounded by high trees and at 2 points in open. Wind in garden was 14–29% of that in open and rainfall averaged 15% more. *Subject Headings:* **1. Microclimates 2. Shelter belts.**—*C.E.P.B.*

5.3–292 551.584.41

Smal'ko, IA. A., **K voprosu ob izmenenii absoliutnoĭ vlazhnosti vozdukha v lesu i na poliakh, zashchishchennykh set'iu lesnykh polos.** [The problem of changing the absolute humidity of air in the forest and in the fields protected by a system of shelter belts.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geograf.*, No. 3:41–43, **1952.** 3 figs., 3 refs. **DLC**—Results of microclimatic observations (of air temperature and humidity, wind velocity and soil temperature) made during 1948–1951 at Vladimirov (Nikolaev region, Ukraine) agro-forest experimental station in order to determine the regular dependence of influence of forests and shelter belts on absolute humidity of the air in different conditions of weather are presented and discussed. They show that: 1) in case of lack of advection from outside changes of absolute humidity in the lowest atmosphere layer depend on the intensity and magnitude of the process "evaporation-condensation" (transpiration included)—highest content of moisture is observed in forest, lowest in steppes; 2) by advection of more humid air when absolute humidity increases in time—its highest value is observed in the steppe, its lowest in the forest; 3) when absolute humidity decreases in time (advection of air with low humidity content)—the greatest decrease of humidity is recorded in steppes, lesser in protected fields and the minimum in forests; 4) in overcast rainy weather—the content of absolute humidity near the ground air layer is the same everywhere. *Subject Headings:* **1. Microclimatic control 2. Forest influences 3. Absolute humidity 4. Shelter belts.**—*A.M.P.*

5.3–293 551.584.61

Deering, Robert B. (*Univ. of Calif. at Davis*), **Technology of the cooling effect of trees and shrubs.** [In: National Research Council, Wash., D. C. Building Research Advisory Board, **Housing and building in hot-humid and hot-dry climates, Nov. 18–19, 1952, Proceedings,** p. 58–65, **1953.** figs., photo., 24 refs.] **DWB**—Plants because of their utilization of solar energy for photosynthesis and transpiration have a great capacity for preventing the passage of solar heat to surfaces on the opposite side. The author discusses the cooling effect of a grass cover, of shrubs and of shade trees. Various ways of utilizing plants in cooling of dwellings are discussed. *Subject Headings:* **1. Cooling effect of trees 2. Indoor climates.**—*I.L.D.*

CLIMATIC CLASSIFICATION

See also: **Sea ports** (Liashnitskiĭ), 5.3–7.

5.3–294 551.585(81)

*Mota, Fernando Silveira da, **Estudos do clima do Estado do Rio Grande do Sul segundo o sistema de W. Koeppen.** [Study of the climate of the Rio Grande do Sul according to the Köppen system.] *Revista Brasileira de Geografia*, Rio de Janeiro, 13(2):275–284, April/June **1951.** 5 tables, diagr., 9 refs. **DWB**—Monthly and annual means of temperature and precipitation, not adjusted to a uniform period, given for 39 stations. Additional data furnished for the number of days with fog. A map shows the distribution of climatic types according to KÖPPEN (mainly cfa, and cfb in higher regions). *Subject Headings:* **1. Köppen's classification 2. Climatic data 3. Rio Grande do Sul, Brazil.**—*A.A.*

5.3–295 551.585:581.54(213)

Tivy, Joy, **The tropical rain forest. Review of: A. F. W. Schimper, Pflanzen-Geographie auf physiologischer Grundlage.** [Plant-geography upon a physiological basis.] *Scottish Geographical Magazine*, 69(2):86–88, Sept. **1953.** 2 refs. **DLC**—*Subject Headings:* **1. Rain forest climate 2. Schimper, A. F. W.**—*C.E.P.B.*

5.3–296 551.585(798)

von Schelling, Herman, **Remarks on the climate in Alaska.** *U. S. Medical Research Laboratory, New London, Conn., Report*, No. 198, March 31, **1952.** 12 p. table, figs., refs. On cover-title: v. XI, No. 15, Report No. 198, 31 March 1952. **DWB**—Author attempts to divide Alaska, North America and the world into climatic regions, disregarding climatic data. He uses hypothetical curves based on mathematical derivations and comes to conclusions difficult to assess without the data which this system purports to replace. *Subject Headings:* **1. Climatic regions 2. Mathematical climatology 3. Alaska.**—*A.A. and M.R.*

BIOCLIMATOLOGY

5.3–297 551.586(213)

Grober, J., **Grundfragen der tropischen Bioklimatik.** [Fundamentals of tropical bioclimatology.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:17–20, **1952. DWB**—Discussion of problems of soil erosion, uniformity of weather and climate and its effect on man, animals and plants. *Subject Heading:* **1. Tropical bioclimatology.**—*C.E.P.B.*

5.3–298 551.586:551.43:581.1

†Malyshev, A. A., **Termoperiodizm i ego znachenie v razvitii rasteniĭ.** [Thermoperiodicity and its significance in plant development.] *Botanicheskiĭ Zhurnal*, Moscow, 37(2):139–157, **1952.** 3 tables, bibliog. **DLC**—Discusses first the dependence of plant growth on meteorological conditions in mountain regions. Plants respond to weather in a complicated way, a few grow faster in high altitudes, others slower; no general law could be found. Experimental data on the duration of growth for different plants under defined conditions are presented (the same duration of day but different combinations of day and night temperatures). The bibliography gives a comprehensive cross section of Russian work in this field. *Subject Headings:* **1. Plant ecology 2. Thermoperiodicity 3. Mountain climatology.**—*A.A.*

5.3–299 551.586:58

Seemann, J., **Gedanken zur Arbeitsweise der Phänometrie.** [Ideas on technique of phenometry.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:250–251, **1952.** 10 refs. **DWB**—Phenometry is the measurement of the influence of weather in life processes. A brief history is given and commented on. *Subject Heading:* **1. Phenometry.**—*C.E.P.B.*

5.3–300 551.586:581.055

Christian, C. S. and Shaw, N. H., **Protein status of Australian tropical and sub-tropical pastures.** (In: Specialist Conference on Plant and Animal Nutrition in Relation to Soil and Climatic Factors, Australia, 1949, **Proceedings, 1951.** p. 225–240. 5 figs., refs.) **DWB**—The protein deficiency which occurs for a large part of the year in the native and sown pastures of the Australian tropics and subtropics is determined by climate through its action upon plant type, season, characteristics of growth and conditions of soil. The variation of protein content with season of native grasses in the subtropics of Western Australia, monsoonal Western Australia, in the Northern Territory, in the inland semiarid region of Queensland and in higher rainfall area of Queensland is discussed. Seasonal curves for crude protein percentages and yield of dry matter and monthly rainfall show that high rainfall is associated with high protein percentage. *Subject Headings:* **1. Plant nutrition 2. Protein content of pastures 3. Rainfall effects 4. Western Australia 5. Queensland.**—*I.L.D.*

5.3–301 551.586(969):582.59

*Vacin, Emil F., **The problem of growing the Cymbidium genus in the Hawaiian Islands.** *Hawaii Orchid Society, Hilo, Bulletin*, 4(1):5–22, July **1952.** figs., photos, tables, refs. **DWB**

—The climates of the Asiatic Cymbidium belt (which includes parts of Bengal and Assam in India, Burma and Indochina) and the Hawaiian Islands are compared. Data are given for average temperature, normal rainfall, and average monthly relative humidity for Darjeeling, Shillong, Lashio, Dalat, Hilu and Popeekeo and the Asiatic Cymbidium belt is shown on a map. The climatic parameters for the cultivation of this genus of orchids are given and its phenology is described in detail. (*See also* 5B–303, Feb. 1954, *MAB.*) *Subject Headings:* **1. Climatic analogs 2. Horticulture 3. Orchids 4. Hawaii.**—*I.L.D.*

5.3–302 551.586:551.521.31

Olgyay, Aladar (*Univ. of Texas*), **Solar control and orientation to meet bioclimatic requirements.** [In: National Research Council, Wash., D. C. Building Research Advisory Board, **Housing and building in hot-humid and hot-dry climates, Nov. 18–19, 1952, Proceedings,** p. 38–46, **1952.** figs.] **DWB**—This paper shows the practical application of a method described in "Bioclimatic Approach to Architecture" by Victor Olgyay (*ibid.*, p. 13–23). Methods of cutting off solar radiation by shading devices and utilizing radiation by proper orientation are described. The procedure for calculating shading performance, the use of the regional shading chart, and the method of orientation on the basis of radiation calculations are outlined and illustrated with the aid of charts and diagrams. *Subject Headings:* **1. Radiation bioclimate 2. Solar radiation control 3. Shading devices 4. Building design.**—*I.L.D.*

UPPER AIR CLIMATOLOGY

5.3–303 551.587(676.2):551.524.7

*Carruthers, Nellie, **Upper air over Nairobi, 1°16′S 36°51′E 5371 ft above M.S.L. A preliminary survey of data to the end of 1949.** *Great Britain. Meteorological Research Committee, M.R.P.* 554, April 18, 1950. 4 p. 2 figs., 5 tables. **DWB**—Based on 416 observations reaching the tropopause in 1948–9, frequencies of temperatures, winds and tropopause heights are given for Nairobi in tables with brief analysis and a graphical representation of average and extreme temperatures and temperature frequencies up to 40 mb. The highest wind speeds occurred in the upper easterly stream (110–160 mb) in the June–Sept. season. Westerly winds appear to prevail above tropopause (80–110 mb), but this may be due to stronger easterlies carrying more balloons beyond range of reception and thus producing a bias in statistics. Distribution of tropopause, temperature and pressure by months and by 2°F and by 10 mb intervals (60–140 mb) and of related tropopause pressure and temperature for Dec.–March and June–Sept. given in extended tables. *Subject Headings:* **1. Tropopause pressure 2. Tropopause temperatures 3. Tropopause height 4. Nairobi, East Africa.**—*M.R.*

ENVIRONMENTAL INFLUENCES

See also: **Changes of liquid water content of intruding stationary sea fog . . .** (Fukutomi), 5.3–247; **Change of urban climate, Trier** (Kaempfert), 5.3–287.

5.3–304 551.588.6(52)

*Nagata, S. (*Nara Gakugei Univ.*), **Micro-climatic observations in the primeval forest in Kasuga, Nara (2). On the comparison between inside and outside of the forest.** *Journal of Agricultural Meteorology*, Tokyo, 7(3/4):95–98, Nov. 1952. 4 figs., 4 tables, 5 refs. In Japanese; English summary p. 98. **MH-BH**—Comparative data on temperature, humidity, precipitation, and temperature variations are presented in tabular and graphical form for Kasuga Forest and Nara city (1950–1951). A similar comparison is made between the forest and Wakakusa Mountain. Characteristics of a forest climate are derived from these comparisons. *Subject Headings:* **1. Forest influences 2. Mesoclimatological data 3. Kasuga Forest, Japan 4. Nara, Japan.**—*G.T.*

5.3–305 551.588.6:63

Němec, Fr. and Ryška, Al., **Klimatický a hydrologický význam lesa pro zemědělství.** [Climatological and hydrological importance of forests in agriculture.] *Za Socialistické*

Zemědělství, Prague, 2(11):1243–1249, Nov. 1952. 2 tables. **DLC**—The contribution of forests to water conservation and consequently to better crops is discussed in general terms. Examples of water infiltration and runoff under different types of forest cover are given in tabular form. In the Russian prairies the climatic benefit of forests is appraised at four times the value of the timber they produce. *Subject Headings:* **1. Forest influences 2. Agriculture.** —*G.T.*

SYNOPTIC CLIMATOLOGY

5.3–306 551.589.5:551.571

Ozoray, Zoltán, **Nedvesség-elemek a légtömeg-elemzésben.** [Humidity factors in air-mass analysis. (Part 1).] *Időjárás*, 55(7/8):188–191, July/Aug. 1951. 14 eqs. **DLC**—In order to define the character of an air mass it is necessary to find within it meteorological elements with conservative (or quasi-conservative) properties. Formulas representing five aspects of atmospheric humidity (vapor pressure, absolute, specific and relative humidity, and mixing ratio) are examined and show that specific humidity and mixing ratio are conservative in respect to isobaric and dry-adiabatic changes, and therefore suited for a limited use in air mass analysis. *Subject Headings:* **1. Air mass analysis 2. Humidity.**—*G.T.*

5.3–307 551.589

Brunnschweiler, Dieter H., **Geographic distribution of air masses in North America.** *Naturforschende Gesellschaft in Zürich, Vierteljahresschrift*, 97(1):42–49, March 31, 1952. In English; Germany summary p. 48–49. **DWB**—Attempt at a new, dynamic classification of climates according to the frequency of air masses. Analysis for North America, presented for winter and summer, is based on five years of weather maps. The "source region" for a given air mass is circumscribed by the isorhythm of 80% prevalence. Limits of "normal expansion" 20%. Areas with air masses in a frequency exceeding 20% were considered as "conflict regions." Percentage of air masses for selected stations are presented graphically. *Subject Headings:* **1. Dynamic climatology 2. Climatic classifications 3. Air mass frequencies 4. North America.**—*A.A.*

MISCELLANEOUS APPLICATIONS

SOLAR INFLUENCES

See also: **Min. night temp. at/or near full moon** (Henstock), 5.3–3; **Actinometric measurements, solar eclipse, Feb. 1952, Tashkent** (Aroslavtsev), 5.3–179; **Upper atmos. winds by meteor-train photography** (Whipple), 5.3–227; **Climatic fluctuations and causes** (Höiland), 5.3–285.

5.3–308 551.590.21:621.396.8

Kamiyama, Hiroshi (*Tohoku Univ.*), **Variation of the effectiveness of the solar flare according to its location.** *Tohoku University, Science Reports, 5th Ser., Geophysics*, 4(1):1–4, June 1952. 3 figs., 2 tables, 5 refs. **MH-BH**—A statistical method is adopted for investigation of the longitudinal effect of a solar eruption upon radio communication. Six hundred and forty eruptions were observed and analyzed during the past four years. The most pronounced effect was found at 30°E–10°W decreasing to a half beyond both 50° meridians. Results are presented in curves and tables. *Subject Headings:* **1. Solar influences 2. Radio fading 3. Tokyo, Japan.**—*W.N.*

5.3–309 551.590.21:551.577

Křivsky, L. (*Central Astronomical Inst., Ondrejov*), **Chromospheric flares and daily precipitations in Prague in the years 1947, 1948 and 1949.** *Prague. Ústřední Ústav Astronomický, Bulletin*, 3(2):25–28, March 31, 1952. fig., 2 tables, 8 refs. **DLC**—A statistical study showing that, on an average, precipitation increases every third to seventh day after the appearance of a significant chromospheric flare by an amount of about 20% (total for the zero day 266 mm, for the fourth day 370 mm—smoothed values). The total number of days with significant flares was 299. *Subject Headings:* **1. Solar influences 2. Precipitation.**—*A.A.*

5.3–310 551.590.21 523.7

Masevich, A. G., **Fizika solntsa.** [Physics of the sun.] *Nauka i Zhizn'*, Moscow, No. 2:19–22, **1952.** illus. **DLC**—A concise, popular, scientific article on the ways in which the sun affects the earth's atmosphere and magnetic field, and the physical, chemical and magnetic phenomena observed on the sun or its various portions (photosphere, chemosphere, sunspots, corona, protuberances, magnetic storms, etc.). The economic importance of our increasing knowledge of the sun is stressed. *Subject Headings:* **1. Solar physics 2. Solar influences.**—*M.R.*

VISIBILITY

5.3–311 551.591.1:535.3

Dunkelman, Lawrence, **Horizontal attenuation of ultraviolet and visible light by the lower atmosphere.** *U. S. Naval Research Laboratory, NRL Report*, 4031, Sept. 10, **1952.** 12 p. 6 tables, 4+figs. (fold.), 13 refs., 8 eqs. **DWB**—Results of measurement made from 1948 to 1951 in different climatic regions of the U. S. are summarized and the attenuation curves (exponential attenuation coefficient versus wave length) critically compared. *Subject Headings:* **1. Atmospheric attenuation 2. Visibility 3. United States.**—*A.A.*

5.3–312 551.591.1:551.574.1:551.576.1

Neiburger, Morris; aufm Kampe, H. J. and Weickmann, H. K., **Visibility and liquid content in cloud.** *Journal of Meteorology*, 10(5):401–404, Oct. **1953.** 13 refs., 8 eqs. **MH-BH**—NEIBURGER comments on AUFM KAMPE and WEICKMANN's discussion of TRABERT's formula for visual range in cloud (*see* 3I–277, Oct. 1952, *MAB*). AUFM KAMPE and WEICKMANN reply. *Subject Headings:* **1. Visibility 2. Water content of clouds.**—*C.E.P.B.*

OPTICAL PHENOMENA

See also: **Atmos. temp. and twilight discontinuities** (Grandmontagne), 5.3–199.

5.3–313 398.3:551.593:551.594

Menzel, Donald H., **Flying saucers.** London, Putnam, **1953.** 319 p. 96 figs., refs. **DLC**—This discursive popular book gives a history of reports of "flying saucers" and attempts a natural explanation of each case. Many of them are optical phenomena, such as mock suns or halos, electrical (St. Elmo's fire), or will-o'-the-wisps. Others of course are imaginary. There is a good deal of meteorology, including atmospheric refraction and auroras, chapters on meteors and comets and on false radar images, and an appendix on the theory of mirages. *Subject Headings:* **1. Flying saucers 2. Optical phenomena 3. Electrical phenomena.**—*C.E.P.B.*

5.3–314 551.593.1:629.12

Sharpey-Schafer, J. M., **Some notes on astronomical observations at sea.** *Institute of Navigation, London, Journal*, 6(4):362–372, Oct. **1953.** fig., 2 tables, 3 refs. **DWB**—Discusses accuracy of fixing position at sea in various parts of the world, including an account of abnormal refraction. In some places two horizons were seen 5–7′ apart. Of 2597 observations 48% showed refraction of 0.4′ or more and more than 1% showed ±1.5′ or more. No relation was found to difference between sea and air temperature. Suggestions are made on observing and instrumental improvements. *Subject Headings:* **1. Refraction 2. Marine navigation.**—*C.E.P.B.*

5.3–315 551.593.1

Abnormal refraction. Off Nova Scotia. North Atlantic Ocean. *Marine Observer*, 23(161):142–143, July **1953.** 8 figs. **MH-BH**—Two cases of superior mirage illustrated: 1) July 6, 1952, in 44°20′N, 63°31′W; 2) Sept. 18, 1952, 48°32′N, 44°50′W. Both showed inverted and direct images. *Subject Headings:* **1. Superior mirages 2. North Atlantic.**—*C.E.P.B.*

5.3–316 551.593.11

Heybrock, W., **Luftspiegelungen in Marokko.** [Mirages in Morocco.] *Meteorologische Rundschau*, 6(1/2):24–25, Jan./Feb. **1953. DWB**—Examples of distortion, "hot air lakes," etc. described. *Subject Headings:* **1. Mirages 2. Morocco.**—*C.E.P.B.*

5.3–317 551.593.62:551.593.63

Lunar rainbows. *Marine Observer*, 22(157):126–127, July **1952.** fig. **DWB**—1) July 18, 1951, 15°21′N, 56°7′W, full moon, lunar rainbow, secondary bow and a third bow outside the second. 2) 56°9′N, 28°45′W, lunar rainbow partly white, partly showing spectrum colors. On p. 127 is a report of a lunar halo of 33½° radius seen in 34°12′S, 164°10′E on July 15, 1951. *Subject Headings:* **1. Lunar rainbows 2. Haloes.**—*C.E.P.B.*

ELECTRICAL PHENOMENA

See also: **Information contained in weather noise** (Fleisher), 5.3–45; **Effect of dust in air on atmos. electricity** (Kulagin), 5.3–117; **Fabry-Perot etalon for upper atmos. temp. measurement** (Armstrong), 5.3–183; **Flying saucers** (Menzel), 5.3–313.

5.3–318 551.594.14

Dawson, K. B., **Radioactive material in the atmosphere.** *British Journal of Cancer*, 6:22–31, **1952.** 6 tables, 10 refs. **DSG**—Summary of observations at 3 sites in London (open air and cellar or raid shelter), Rothamsted and Manchester, in curies/m³. No consistent differences from town to country in the open, but rapid variations from day to day. Underground amounts were more than 100 times greater than open but did not reach harmful level. *Subject Heading:* **1. Radioactivity in the atmosphere.**—*C.E.P.B.*

5.3–319 551.594.2 551.508.94

†Chapman, Seville, **Thundercloud electrification studies, II.** Cornell Aeronautical Laboratory, Inc., Contract N6ori-119, Task Order 13, Final Report, No. VC-603-0-1, June 20, **1952.** Each section separately paged. figs., tables, 44 refs. **DWB**—Extensive laboratory research on rain drop tubes, snow meters, corona point instrumentation and radiosonde modification in order to investigate the generation of electrical charge in thunderclouds. Disruptions of drops in the "raindrop tubes" generate charges of less than 10^{-13} to more than 10^{-10} coulombs per drop, dependent on the method of disruption. Theoretical explanation proposed. It is assumed that thundercloud turbulence is sufficient to yield this electrification. The "snow-meter" is an apparatus for measuring the electrification of snowflakes on impact with each other, and for photographing the snowflake. "Corona-point" records obtained as a measure of the earth's electric field (6 samples of graphical records presented). Large fluctuations observed during a storm period. Corona point records were made also on modified radiosondes sent into snow clouds during blizzards. Detailed description of electronic equipment developed for these investigations is given (performance, circuit diagrams). *Subject Headings:* **1. Thundercloud electrification 2. Raindrop charges 3. Snowflake charges 4. Laboratory equipment. I. Cornell Aeronautical Laboratory, Inc. II. Contract N6ori-119, Task Order 13.**—*A.A.*

5.3–320 551.594.2

Muchnik, V. M., **Vliianie elektricheskogo polia na protsessy elektrizatsii v grozovykh oblakakh.** [Influence of electric field on the process of electrification in thunderclouds.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geofiz.*, No. 6:79–82, **1952.** 14 refs. **DLC**—The results of studies on the effect of the electric field upon the electric charge of droplets during shattering, such as the spontaneous shattering of droplets during their fall, during fragmentation from melting ice and during collision with steel spheres. The author maintains that hydrometeors such as hail and ice particles play a fundamental role in the electrification of thunderclouds. *Subject Headings:* **1. Thundercloud electrification 2. Electrical charges on raindrops.**—*I.L.D.*

5.3–321 551.594.2:551.515.4

Uchikawa, K. and Ogino, Y., **The observation of the electric field in thundercloud.** *Tateno. Aerological Observatory, Journal,* 5(1):15–19, March, **1951.** 6 figs., 3 refs., English summary, p. 15.—Alti-electrographs according to Simson's method equipped to sounding balloons were sent into thunderclouds. Positive and negative field recorded. *Subject Heading:* **1. Thunderstorm electricity.**—*A.A.*

5.3–322 551.594.2:537.311.36

Whybrew, Waldo E., Kinzer, Gilbert D. and Gunn, Ross (*U. S. W.B., Wash., D. C.*), **Electrification of small air bubbles in water.** *Journal of Geophysical Research,* 57(4):459–471, Dec. **1952.** 8 figs., table, 6 refs., 6 eqs. **MH-BH**—Steady velocities of an air bubble moving along the axis of rotation of a glass cell filled with water were measured at two angles of tilt from a horizontal direction and at several rotational speeds. These velocities, many times smaller than Stokes' law would predict, can be explained by taking into consideration hydrodynamic forces which depend on density and the speed of rotation. An experimental determination of the law of resistance to the movement of a bubble in this rotating system leads to revised estimates of apparent surface electrical charge density inferred from measurements of electrical mobilities. These estimates, approximating 0.8 esu cm^{-2}, are ten or more times larger than formerly reported. Furthermore, the surface charge density appears to be nearly independent of the bubble diameter. The electrification has been measured in a different manner with the same apparatus by establishing a static balance between the force of an electric field parallel to the axis of rotation and a component of the force of buoyancy. The charge carried by the bubble is not dependent upon its motion. The electrification of bubbles of air rising freely in water was measured also, and the magnitude of the apparent surface charge density has been found to be only about one-third that obtained with the rotating system under similar chemical conditions. This discrepancy is believed to be due to a lack of sufficient time for the rising air bubbles to attain an equilibrium electrified state. The observed effect of CO_2 as a water impurity is to reduce the electrification of an air bubble, in agreement with the measurements of other investigators. *Subject Headings:* **1. Electrification of air bubbles 2. Cataphoresis 3. Cloud physics.**—*Authors' abstract.*

5.3–323 551.594.7

Brunberg, Ernst-Åke (*Royal Inst. of Technology, Stockholm*), **Experimental determination of electron orbits in the field of a magnetic dipole.** *Tellus,* 5(2):135–156, May **1953.** 11 figs., 14 diagrs., 10 refs., 11 eqs. Also condensed in: *Journal of Geophysical Research,* 58(2):272–275, June **1953. MH-BH**—An analogue method for determination of electron orbits in a magnetic dipole field has been developed by MALMFORS several years ago. The method is in principle a scale model experiment in a vacuum chamber where the results are obtained by measuring the deflection of an electron beam in the field of a "terrella." During the last years this method has been further developed, and particle orbits corresponding to the following momenta have now been measured: 1) $2 \cdot 10^9 - 10^9 eV/c$ Orbits arriving at magnetic latitude 58° in E, S, W and N directions at zenith angles of 0°, 20°, 40°, 60°, 80°. Orbits arriving from zenith at different latitudes beginning with 38 and continuing at intervals of 2 degrees up to the pole. 2) $10^{10} - \infty eV/c$ Orbits arriving at magnetic latitude 0°, 10°, 20°, 30°, 40°, 50°, 60°, 70°, 80°, and 90° from E, S, W and N directions at zenith angles of 0°, 8°, 16°, 24°, 32°, 40°, 48°, 56°, 64°, 72°, and 80°. The direction of orbits far away from the dipole is published as a function of momentum. The particles are assumed to move towards the earth and to be positively charged. This article includes only diagrams for the latitude 90°–60°. The remaining ones will be published in the next issue of this journal. *Subject Headings:* **1. Dipole fields 2. Electron orbits.**—*Author's abstract.*

5.3–324 551.594.7

Unwin, R. S., **Ultra-short-wave field-strength in a ground-based radio duct.** *Nature,* London, 172(4384):856–857, Nov. 7, **1953.** fig., 8 refs. **DWB**—Data from New Zealand Canterbury Project show that duct width is the most important parameter in field strength beyond the horizon. Examples reproduced show that as duct width increases from zero field strength increases from a low value up to a certain level (where first node goes from a

leaky to a trapped state) after which it increases very slowly or remains constant. The critical duct width increases from 27 m on 3 cm wave-length to 90 m on 60 cm but scatter is large. *Subject Headings:* **1. Radio transmission ducts 2. Superrefraction.**—*C.E.P.B.*

ACOUSTICAL PROPAGATION

5.3–325 551.596.1:550.34(54)

Mukherjee, S. M. (*Met. Off., Poona*), **Landslides and sounds due to earthquakes in relation to the upper atmosphere.** *Indian Journal of Meteorology and Geophysics*, 3(4):240–257, Oct. **1952.** 2 figs., 3 tables, 37 refs. **DWB**—General discussion of abnormal propagation of sound due to earthquakes with special reference to the earthquake of Aug. 15, 1950. A comprehensive survey of sound observations for this earthquake and some important previous ones is added. Travel times of abnormal sounds computed and connection with thermal structure of the upper stratosphere briefly described. *Subject Headings:* **1. Acoustical propagation 2. Earthquakes 3. Upper atmosphere 4. India.**—*A.A.*

5.3–326 551.596.1:534.6:551.507.362

Temple University. Research Institute, **Research in the physical properties of the atmosphere with rockets.** Contract W19-122-ac-12, Reports Nos. 13–14, Apr. 1–June 30, July 1–Sept. 30, 1951, Aug. 16, **1951** and Jan. 28, **1952.** 2 pieces. figs., refs., eqs. **DWB**—In further pursuit of investigating the absorption of sound at very low pressures (down to .35 mm Hg) using frequencies from 18 to 75 KC, the response of Western Electric Condenser Microphone 640 AA to varying pressure and frequency output was measured. Photographs of records, diagrams of apparatus used (signal generator, wave analyzer, oscilloscope, etc.) and response curves are presented in Report 13 with a thorough discussion of results. Report 14 is a theoretical study of transmission losses due to variations in coupling and to absorption by the medium. *Subject Headings:* **1. Rocket instrumentation 2. Sound absorption. I. Bohn, J. Lloyd II. Nadig, Francis H. III. Contract W19-122-ac-12.**—*G.T.*

5.3–327 551.596.9

Cave, C. J. P., **The Barisal guns.** *Weather*, 5(4):149, April **1950.** Correspondence by W. Hayes and J. Wadsworth, *ibid.*, 5(8):293, Aug. **1950. DWB**—Correspondence initiated by C. J. P. CAVE about unexplained booming noises in hot, still weather, known in Ganges delta as "Barisal guns." Also known in Australia as "Hanley's guns." *Subject Headings:* **1. Brontides 2. Acoustical phenomena. I. Hayes, W. II. Wadsworth, J.**—*C.E.P.B.*

MISCELLANEOUS

5.3–328 5:06

Zych, Stanislaw, **Cele i Kongresu Nauki Polskeij.** [The aims of the First Polish Science Congress.] *Gazeta Obserwatora PIHM*, Warsaw, 4(5):1–4, May **1951.** photo. (of delegates) facing p. 1. **DLC**—General aims and objects are to: 1) throw light upon the present state of Polish science; 2) deepen and expand its activity; 3) bring science and its workers closer to the "people's democracy" and the life of the whole nation; 4) determine and point out its contribution to the world's scientific achievements; 5) review the most important and urgent problems confronting Polish science and put them in perspective; 6) get acquainted with Soviet science. In the domain of meteorology there are many problems of agricultural and forest meteorology, weather forecasting and climatology which will have to be considered and discussed. *Subject Headings:* **1. Polish Science Congress 2. Poland.**—*A.M.P.*

5.3–329 517.512.2:551.465

Birkhoff, Garrett (*Harvard Univ.*) and Kotik, Jack (*M.I.T.*), **Fourier analysis of wave trains.** p. 221–234 of unidentified reprint. 3 figs., table, 9 refs. Latest ref. dated **1950. DWB**—One-dimensional trains of gravity waves analyzed, discussing spectra of components and kinetic energy totaled over space or time. An autocorrelation function using the principle of random phase is proposed. Fourier analysis made of the relation between elevation and

pressure for ocean waves, suggesting new statistics for the variation of waves. Some actual observations are analyzed. *Subject Headings:* **1. Ocean waves 2. Wave statistics 3. Fourier analysis.**—*A.A.*

5.3–330 517.512.2

Frolow, V., **Méthodes d'analyse et techniques de prévision à longue échéance.** [Methods of analysis and techniques of long-range forecasting]. Paris, Gauthier-Villars, **1949.** 104 p. 29 figs., tables, 37 refs. **GB-MO**—A discussion of methods of periodogram analysis applicable to meteorological or hydrological series, with special reference to those of H. and Mme Labrouste and C. E. P. Brooks. Other methods considered are those of Axel Wallen, H. Arctowski, Buys Ballot, Schuster and A. Streiff. *Subject Heading:* **1. Periodogram analysis.**—*C.E.P.B.*

5.3–331 517.512.2:551.465

Soloveĭchik, K. I., **Uproshchennye skhemy dlia obrabotki sutochnogo tsykla nabliudeniĭ nad techeniiami metodom garmonicheskogo analiza po sposobu Arkticheskogo instituta.** [Simplified method for the harmonic analysis of diurnal cycles in observations of sea currents using the method of the Arctic Institute.] *Meteorologiia i Gidrologiia*, No. 7:39–43, **1952.** 2 figs., eqs. **DLC**—Description of computation system used at present in the Far Eastern Hydrometeorological Institution. The proposed system is analogous to computation schemes applied in astronomy and geodesy and is intended for the following stages of computation: the computation of summary flow components along meridians and parallels for each hour of lunar time and their harmonic analysis; computation of hourly values of direction, phase and speed of maximum daily, half- and quarter-daily values for tide flow and the hourly values of direction and speed of residual flow. *Subject Headings:* **1. Ocean currents 2. Harmonic analysis.**—*N.T.Z.*

5.3–332 536.6:001

Niehrs, Heinz, **Analyse der Begriffe Temperatur und Wärmemenge.** [Analysis of the terms temperature and heat content.] *Akademie der Wissenschaften in Göttingen, Math.-Phys. Klasse, IIa Math.-Phys.-Chem. Abt., Nachrichten*, No. 1, **1951.** 28 p. **GB-MO**—A philosophical discussion of the minimum conditions necessary to define a magnitude shows the reality of "thermometry" and "temperature." For if A under ideal conditions can transfer some indicator of temperature to B, A must have a greater temperature than B. When no transference occurs (e.g. thermometer remains steady) temperatures are the same. The definition of the quantity of heat, and calorimetry based on it, are also examined. *Subject Headings:* **1. Definitions 2. Temperature 3. Thermometry.**—*C.E.P.B.*

5.3–333 517.94:519.2(02):681.17

†Dwyer, Paul Sumner (*Michigan Univ.*), **Linear computations.** N. Y., Wiley, **1951.** 344 p. tables, refs., eqs. **DWB**—A textbook for the general problem of finding solutions of simultaneous linear equations. The elementary methods as well as the use of determinants and matrices are explained. No attempt is made to give exact mathematical proofs but a comprehensive coverage of practical methods is given. Especially useful are the evaluation of errors, explanations how to utilize punched cards and high speed computors and a chapter devoted to application to statistics. *Subject Headings:* **1. Linear equations 2. Determinants 3. Mathematical statistics 4. Textbooks.**—*A.A.*

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON THE PHYSICS OF AURORA

By: *Mary L. Rice and Malcolm Rigby*

EXPLANATORY NOTE

This is the second of a series of bibliographies on auroras and related phenomena. The general or descriptive material appeared in v. 4, No. 10, Oct. 1953, *Meteorological Abstracts*. The third bibliography in this series will deal with **Night Airglow** (Light of the Night Sky).

Even on the more restricted subject of **Physics of Aurora** it is impossible to publish an exhaustive bibliography. The Norwegian geophysicists, STÖRMER, VEGARD and their colleagues, alone have written several hundred papers. We have, however, included a representative cross section of the various aspects of the subject, particularly papers dealing with the relationships between auroras and the sun and geomagnetism, investigations of auroral spectra (both in nature and the laboratory), research on the upper atmosphere through investigations of auroral phenomena and techniques of auroral research. The Outline of Contents presents in some detail the various subjects treated under the above mentioned broad aspects of the subject as well as a guide to the geographic areas covered.

Those items preceded by a dagger (†) indicate sources of additional references. The bibliography published in the Oct. 1953 issue of *Meteorological Abstracts* contained several bibliographic sources on all phases of auroral phenomena (*see* 4J–49, –115, –159, –161, –177, –206, –207, –210, –217, –221, –230 and –245). Textbooks included in the first bibliography (*see* 4J–19, –28, –64, –103, –144, –184, –206, –221, –244 and –245) should also be consulted for material on Physics of Aurora. Items preceded by an asterisk (*) contain data.

We wish to express our appreciation for the assistance rendered by Mr. E. V. Ashburn of the Naval Ordnance Testing Station, Inyokern, Calif., in allowing us to consult a file of several hundred references on the Aurora and Airglow which he had accumulated over a period of years.

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BIBLIOGRAPHY ON THE PHYSICS OF AURORA

1869

5C–1 551.594.51 551.521.4

Ångström, J. A., **Spectrum des Nordlichts.** [Auroral spectrum.] *Annalen der Physik und Chemie,* Leipzig, 137:161–163, **1869.** refs. **DLC**—Extract from author's "Recherches sur le spectre solaire," Uppsala, 1868, with Atlas of six plates. Contrary to the logical conclusions that, since the aurora is evidently an electrical phenomenon in rarefied air and hence should have a spectrum similar to that of lightning, the author found that the auroral spectrum (displays observed in Uppsala in winter of 1867–8) is monochromatic, with a notable line at 5568Å just to the left of the known groups of Ca lines, but not corresponding to any hitherto identified lines. The same line was found in the zodiacal light and even very faintly in the night sky in absence of aurora, and in all directions. Evidently first observation of auroral spectra. *Subject Heading:* **1. Auroral spectra.** —*M.R.*

1872

5C–2 551.594.5:550.38

Moerlin, C., **Zusammenstellung der Südlichter und magnetischen Störungen in Australien mit den gleichzeitigen Nordlichtern und magnetischen Störungen in Europa.** [A list of aurora australis and magnetic storms in Australia simultaneous with aurora borealis and magnetic storms in Europe.] *Wochenschrift für Astronomie, Meteorologie und Geographie,* Halle, 15(22):173–174, May **1872. DLC**—Auroras and magnetic storms recorded are for the period March–July, 1871. *Subject Headings:* **1. Auroral magnetic relationships 2. Australia 3. Europe.**—*M.L.R.*

5C–3 551.594.5

Müller, Johann H. J., **Das Nordlicht.** [Aurora.] (In his: **Lehrbuch der Kosmischen Physik.** Brunswick, Friedrich Biewig and Son, **1856.** p. 498–513. figs. 3rd ed. **1872.**) **DLC**—In the first edition of this remarkable "Lehrbuch" the section of the aurora consists mainly of description of unusual auroras (e.g., 1817, 1836) and those observed at Bossekop in 1838–9 (143) among which were many sunlit auroras. The relation between the aurora and geomagnetism, and the height and audibility discussed. In the 3rd edition the author summarizes the investigations made between 1860 and 1870 in the new field of auroral spectroscopy by ÅNGSTRÖM, ZÖLLNER and others. The analogy between the aurora and discharges in rarified gases in Geissler tubes is discussed pro and con. Finally, an attempt to reproduce the aurora on a global model in the laboratory by DE LA RIVE (1862) and a theory of the aurora by the same author (based on global circulation of atmospheric electric charges) is recounted and the laboratory apparatus illustrated. *Subject Headings:* **1. Auroral spectra 2. Experimental auroras 3. Auroral theories. I. de la Rive, Auguste A. II. Ångström, J. A.**—*M.R.*

1881

5C–4 551.594.5

Goldstein, Eugen, **Ueber die Entladung der Electricität in verdünnten Gasen.** [Electric discharges in rarefied gases.] *Annalen der Physik und Chemie,* New Ser., Leipzig, 12(2):249–279,

1881. refs. **DLC**—In a lengthy article on the results of numerous laboratory experiments on the behaviour of electric discharges in rare gases (Crookes tubes) with different magnetic influences, gases, pressures, shapes of tubes, etc., the author suggests (p. 266) that the sun might send out electric radiations as well as light, which might behave in a vacuum or rare gas similarly to the cathode rays in the laboratory. This he suggests, might explain a number of "terrestrial phenomena of an electric and magnetic nature which show some periodic or other connection with solar variations, and which men had hitherto attempted to explain on the basis of static influences, magnetic induction, etc. of the sun." This suggestion, anticipated BIRKELAND's 1896 theory by over 15 years, though GOLDSTEIN does not specifically mention the aurora as one of these "terrestrial electromagnetic phenomena." *Subject Headings:* **1. Auroral theories 2. Experimental auroras 3. Cathode-ray tubes 4. Electromagnetic theory of aurora.**—*M.R.*

1894

5C–5 551.594.5

Paulsen, Adam F. W., **Sur la nature et l'origine de l'aurore boréale.** [On the nature and origin of the aurora borealis.] Copenhagen, **1894.** 23 p. **GB-MO**—After describing his own observations at Godthaab, Greenland (64°11′N) and those by M. VIDEL IN 70°27′N, 26°10′W, including potential at earth's surface falling during aurora, author sets out theory that aurora is a fluorescence due to absorption of radiant energy emitted by a layer of negative electricity in upper atmosphere deriving energy from the sun. Analogy is drawn with discharge from negative pole in evacuated tube, and since this produces ozone, so does aurora. Ozone being a conductor, electric currents flow appearing as auroral movements from poles towards equator. At sunspot maxima auroras decrease in high and increase in lower latitudes (like magnetic disturbances). *Subject Heading:* **1. Auroral theories.**—*C.E.P.B.*

1896

5C–6 551.594.5

Birkeland, Kristian, **Sur les rayons cathodiques sous l'action de forces magnétiques intenses.** [On cathode rays under the action of intense magnetic forces.] *Archives des Sciences Physiques et Naturelles*, Geneva, Ser. 4, 1:497–512, **1896. DLC**—Laboratory experiments on cathode rays in tubes under the influence of magnetic fields are described in detail and the analogy to auroral manifestations suggested. The polarity of the aurora and the source of the energy are the two aspects that could be explained only on the basis of a hypothesis of polar origin of energy and action of magnetic poles in concentrating the discharges. *Subject Headings:* **1. Auroral theories 2. Experimental auroras 3. Cathode-ray tubes 4. Electromagnetic theory of aurora.**—*M.R.*

1900

5C–7 551.594.51

Paulsen, A., **Sur le spectre des aurores polaires.** [On the auroral spectra.] *Académie des Sciences, Paris, Comptes Rendus*, 130:655–656, March 3, **1900. DLC**—With a quartz spectrograph and a more powerful glass prism spectrograph, many lines in the UV (oxygen) were obtained. Five strong and 17 feeble lines obtained with these instruments are listed. Sixteen of the lines were new, though several were obtained at times when no visible aurora was evident. *Subject Headings:* **1. Auroral spectra 2. Auroral oxygen lines.**—*M.R.*

5C–8 551.594.5

Arrhenius, Svante, **Ueber die Ursache der Nordlichter.** [On the cause of aurora.] (*K.*) *Svenska Vetenskaps-Akademiens, Öfversigt af Förhandlingar*, Stockholm, 57(5):545–580, **1900.** refs. **DLC**—A very long theoretical (though mostly non-mathematical) discussion of the nature of electrical corpuscles ejected from the sun by the pressure of light waves, and of the action of these particles (negatively charged) in the earth's magnetic field to produce the aurora. The various periodicities (long period, annual, monthly, daily, lunar, etc.) and variations due to other causes observational errors, etc. are discussed and explained in the light of this theory. The recently discovered ionization of the upper atmosphere is also explained on the basis of these showers of particles from the sun. Finally, mention is made of MAIRAN's nearly correct hypothesis which was arrived at 150 years earlier in spite of lack of physical knowledge, mainly on account of careful analysis of good observational material. *Subject Headings:* **1. Auroral theories 2. Negative particles. I. Mairan, J. J. Dortous de.**—*M.R.*

1901

5C–9 551.594.5:550.38(481)

Birkeland, Kristian, **Expedition Norvégienne de 1899–1900 pour l'étude des aurores boréales. Résultats des recherches magnétiques.** [Norwegian Expedition of 1899–1900 to study the auror

borealis. Results of magnetic research.] *Videnskabs-selskabet i Kristiana, Math.-Naturvidenskapelig Klasse, Skrifter*, No. 1, **1901.** 80 p. 12 plates (some fold.), port. **DLC**—Report contains discussion of simultaneous variations in geomagnetism at Bossekop and Potsdam and relation to aurora and upper atmospheric electric currents. Theory is developed and laboratory experiments illustrating the aurora in a cathode ray tube (artificial auroral bands) described. Finally, a discussion of possibility that cirrus clouds could be formed by extension of auroral action into lower levels of upper atmosphere is presented in some detail. *Subject Headings:* **1. Auroral magnetic relationships 2. Experimental auroras 3. Cirrus clouds 4. Bossekop, Norway.**—*M.R.*

1903

5C–10 551.594.5:523.75

Archenhold, F., **Sonnenflecken, Erdströme und Nordlichter.** [Sunspots, earth currents and auroras.] *Das Weltall*, Berlin, 4(4/5):71–75, Nov./Dec. **1903.** 2 plates (preceding p. 71). **DLC**—The author resolves the controversy over whether sunspots or solar faculae are responsible for terrestrial magnetic and auroral phenomena in favor of a third source of the "electromagnetic waves" which he thinks produce the aurora—namely, solar protuberances or flares such as could be photographed (even in absence of an eclipse) since 1868. The major storm and aurora of Oct. 31, 1903 which was greatest disturbance recorded at Greenwich since 1882 (Nov. 17), is treated in detail from a physical point of view. *Subject Headings:* **1. Auroral solar relationships 2. Solar flares.**—*M.R.*

1904

5C–11 551.594.5:550.38

Elvins, A., **Magnetic storms, aurorae, and sun-spots.** *Electrician*, London, 54(1383):165, Nov. 18, **1904. DLC**—Report of a lecture to the Canadian Institute. Author believes that sunspots, auroras and magnetic storms are caused by "matter forming in space, and passing sunward in orbits, more or less elliptical, which, when they cross the earth's orbit, produce aurora and magnetic storms, pass on sunward, and by planetary perturbations and collisions fall in part on the sun and produce solar disturbances." Also offers an explanation as to why magnetic disturbances are more numerous at the time of the equinoxes. *Subject Headings:* **1. Auroral theories 2. Auroral magnetic relationships.**—*M.L.R.*

5C–12 551.594.51:550.38

Lockyer, Sir Norman and Lockyer, William J. S., **Probable cause of the yearly variation of magnetic storms and aurorae.** *Royal Society of London, Proceedings*, 74(498):90–95, Aug. 10, **1904.** 2 figs., refs. **DLC**—"Seasonal variations in the frequency of magnetic storms and aurora depend upon the position of the sun's axis in relation to the earth, epochs of the greatest inclinations of the sun's axis towards or away from the earth . . . correspond to those of greatest magnetic and auroral frequency," and "the epochs . . . when the solar regions are most disturbed synchronize with those when the excess of the equinoctial over the solstitial frequency of magnetic storms is greatest."—*Subject Heading:* **1. Auroral magnetic relationships.**—*From authors' conclusions.*

1906

5C–13 551.594.51

Villard, P., **Les rayons cathodiques dans le champ magnétique.** [Cathode rays in the magnetic field.] *Société Internationale des Électriciens, Paris, Bulletin*, 6(52):45–67, Feb. **1906.** 21 figs. **DLC**—An attempt to explain more of the details of the aurora by the analogy between cathode rays encountering a rotating ball having a magnetic field, but assuming that such rays could not escape from the sun, as ARRHENIUS (*see* 5C–8 above) had surmised, if the sun had a magnetic field unless that field touched the earth's magnetic field. Drawings and photographs of laboratory "auroras" are used to support the hypothesis regarding causes of height changes, intensity of lower border, movements of rays and time of maximum intensity. *Subject Headings:* **1. Auroral physics 2. Experimental auroras.**—*M.R.*

1908

5C–14 551.594.51:550.38

Sidgreaves, Walter, **The magnetic disturbances of September 29 and aurora borealis.** *Nature*, London, 78(2035):663, Oct. 29, **1908. DLC**—An unusually bright aurora at Omaha, Nebraska on the night of September 28 appears to have begun and ended synchronously with the greater deflection of the needle as recorded during a magnetic disturbance recorded at Stonyhurst College Observatory from 4 to 7 a.m. on Sept. 29. *Subject Heading:* **1. Auroral magnetic relationships.**—*M.L.R.*

1909

5C–15 551.594.5:550.38

Gregg, W. R., **Aurorae and magnetic storms.** *Mount Weather Observatory, Bulletin*, 1:232–236, **1908. DLC.** Also: **Auroral displays and magnetic storms of September, 1908.** *Ibid.*, 2:19–23, **1909. DLC**—First article describes magnetic disturbances observed on March 27–28. Faint aurora observed at Mount Weather during evening of March 26. Aurora observed elsewhere in U.S. on March 27 (coincident with largest fluctuations of the magnets). Magnetic traces received from Honolulu and Potsdam showed large fluctuations on March 26 and 27, and auroras were observed widely throughout the Northern Hemisphere. Aurora also observed at Mount Weather on May 25; a magnetic storm of considerable severity occurred at the same time. Concludes with brief reference to work of BIRKELAND, STÖRMER, VILLARD and others on the theories of aurora. In the second article observations of aurora during the month are compared with readings of the Wild magnetograph and observations of sunspots. Frequency of auroras shows a 60-year periodicity. *Subject Headings:* **1. Auroral magnetic relationships 2. Mount Weather, Virginia.**—*M.L.R.*

5C–16 551.594.51:550.38

Birkeland, K., **Sur la cause des orages magnétiques.** [Cause of magnetic storms.] *Académie des Sciences, Paris, Comptes Rendus*, 147(12):539–543, Sept. 21, **1908.** 5 figs. **DLC**—Also: **Les orages magnétiques polaires et les aurores boréales.** [Polar magnetic storms and aurora.] *Ibid.*, 148(1):30–33, Jan. 4, **1909.** 3 figs., refs. **DLC**—The author shows in the first paper that there are 2 kinds of magnetic storms, 1) simple and 2) complex; that the simple storms are of 4 types (a) equatorial positive and (b) negative, (c) polar positive and (d) negative, and that the complex storms are composed of several of these types together. Data from the Norwegian Aurora Polaris Expedition 1902–3 and laboratory demonstrations with cathode ray tubes support his theory of the solar origin of auroras and magnetic storms. The various types are shown by inserting a small magnetic sphere (terrella) in the tube and observing the incidence of the rays on the sphere (a.m. or p.m. side). The second report shows 12 types of artificial auroras and their magnetic storm counterparts. *Subject Headings:* **1. Auroral theories 2. Experimental auroras 3. Magnetic storms.**—*M.R.*

1910

5C–17 551.594.51:016

†Kayser, Heinrich G. J., **Spectrum des Nordlichtes.** [Auroral spectra]. (In: **Handbuch der Spectroscopie.** Leipzig, S. Hirzel, **1910.** v. 5, p. 47–58. 101 refs., table.) **DLC**—After presenting a catalog of >100 references to works reporting auroral spectra (from 1855 to 1904) and a running summary of the outstanding contributions involved in these articles, the author presents a table giving the wave lengths of the lines discovered by the various authors from ÅNGSTRÖM (1867) to WESTMAN (1904). The most commonly observed line was, of course, the green line first reported by ÅNGSTRÖM at 5567 Å and observed by every subsequent author at some place between 5544 and 5690 Å. D. ALTER in the U.S.A. in 1855 was the first to suggest that the auroral color was probably an indication of the gaseous elements involved in the phenomenon. *Subject Headings:* **1. Auroral spectra catalogs 2. Auroral bibliographies.**—*M.R.*

1911

5C–18 551.594.51:550.38

Birkeland, K., **Orages magnétiques et aurores polaires.** [Magnetic storms and aurora.] *Archives des Sciences Physiques et Naturelles*, Geneva, Ser. 4, 32(8):97–116, Aug. **1911.** 16 figs., plates (after p. 104), eqs. **DLC**—Reviews results of a Norwegian Aurora Polaris Expedition, 1902–03, pub. in 1908 (*see* 4J–42, Oct. 1953, *MAB*). A large number of magnetic storms observed at 25 stations in 1902–3 and at 15 stations in the Polar Year (1882–3) were studied in relation to accompanying auroral activity. Four types of magnetic storms are distinguished for statistical purposes and the direction of the forces shown on separate charts for each station for each type. The solar origin, nature of radiations responsible for aurora and storms (physical analogy with laboratory "terrella" in cathode ray tube for 4 types) and explanation of draperies and their motion on electromagnetic basis treated here. *Subject Headings:* **1. Auroral magnetic relationship 2. Auroral solar relationships.**—*M.R.*

5C–19 551.594.51

Calloch de Kerillis, Henri A., **L'aurore boréale; théorie et lois héliodynamiques, nouvelle théorie de l'aurore présentée le 23 Mai 1910 à l'Académie des Sciences.** [Aurora borealis; theory and heliodynamic laws, new theory presented May 23, 1910 at the Academy of Sciences.] Paris, G. Ficker, **1911.** 233 p. At head of title: Société d'Océanographie du Golfe de Gascogne. **DLC**—The main purpose of this study is to substantiate the author's heliodynamic theory of the physical nature of auroras. According to this theory there is an auroral pole at 81°N lat., between the

geographic and geomagnetic poles. A translucid matter floating at high altitudes is arranged by geomagnetic forces in several concentric circles around the auroral pole. This matter, having no luminosity of its own, becomes luminescent when it passes through a dynamic "antisolar zone." Thus the auroral phenomenon may be interpreted as a combined effect of geomagnetic and solar activity. The author finds confirmation of his theory in the geographical distribution of auroras, in their daily maximum intensity at each location and in their diurnal and annual periodicities. He presents ample observational material in support of his statements. *Subject Headings:* **1. Auroral theories 2. Heliodynamic theory.**—*G.T.*

1912

5C–20 551.594.51

†*Störmer, Carl, **Sur les trajectoires des corpuscules électrisés dans l'espace sous l'action du magnetism terrestre avec application aux aurores boreales.** [On the trajectories of electric corpuscles in space under the influence of terrestrial magnetism with application to auroras.] *Archives des Sciences Physiques et Naturelles*, Geneva, 4th Ser., 24(7–10):5–18; 113–158; 221–247; 317–264, July–Oct. **1907.** numerous figs., plates (at end of issues), refs., eqs. Also: **Sur les trajectoires . . . Second mémoire.** *Ibid.*, 4th Ser., 32(8–12):117–123; 190–219; 277–314; 415–436; 501–509, Aug.–Dec. 1911; 33(1–2):51–69; 113–150, Jan.–Feb. 1912. numerous figs., tables plates (at end of issues), eqs. Bibliog. of 23 works by author in v. 33, p. 149–150. **DLC**—A complete exposition of STÖRMER's theory as reported briefly in *Académie des Sciences, Paris, Comptes Rendus*, 1906 and in *Archiv for Mathematik og Naturvidenskap*, Christiana, 1906. BIRKELAND's theories and experiments begun in 1896 are first reviewed in detail, then the complete theory of electrical particles moving in a magnetic field is developed, the differential and integral equations set forth, and applied to BIRKELAND's laboratory experiments and then to the aurora and auroral zone taking account of the extraterrestrial (solar) origin of the rays, and the magnetic field of the earth. He shows that the theory explains why rays emitted from an active solar eruption are much less easily deviated by the magnetic field of the earth and hence appear at lower latitudes than the quiet day auroras which are not so powerful. The variable nature of the aurora and the sudden onset or cessation is explained on the theory that the particles are not sent out from the sun evenly in all directions, but in spiral bundles of cones which are only occasionally encountered by the earth. Elaborate tables are presented for calculation of the height, penetrating power, temperature of auroral zone, location of zone of maximum activity, absorption, etc. The theory is worked out in detail for each phase and attempts made to show the relation of observational data to these theories. The sign of the charge is shown to depend on the sense of the rotation of the rays coming from the sun and the geometry of this is worked out. A list of all STÖRMER's works to date is presented on p. 149–150 of v. 33. Finally, a number of calculations of auroral photographs are made and the implications as to the physical nature of the phenomena set forth. *Subject Headings:* **1. Auroral physics 2. Auroral theories 3. Störmer's theory.**—*M.R.*

5C–21 551.594.51:523.74

Vegard, Lars, **On the properties of rays producing aurora borealis.** *London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, Ser. 6, 23(134):211–237, Feb. **1912.** 7 figs., 4 tables, refs. 3 eqs. **DLC**—The author attempts to show that the physical characteristics of auroral draperies and similar auroral forms support the theory of BIRKELAND that they originate in α rays from the sun, whereas the assumption of β rays being the origin leads to great difficulties. The height, the maximum luminosity near the end of the streamers and the lack of scattering (straight line nature) support the α hypothesis. The parallel rays such as occur in draperies suggest a common source (such as the sun), and their similarity to positive α rays suggests a radioactive source. Other auroral forms (i.e., diffuse arcs) may have some other explanation. *Subject Headings:* **1. Auroral physics 2. Auroral draperies 3. Birkeland (α ray) theory 4. Solar origin of auroras.**—*M.R.*

1913

5C–22 551.594.5

Vegard, Lars, **Photographische Aufnahmen des Nordlichtspektrums mit einen Spectrographen von grosser Dispersion.** [Photographs of the auroral spectrum with a wide dispersion spectrograph.] *Physikalische Zeitschrift*, Leipzig, 14(15):677–681, Aug. 1, **1913.** 3 tables, refs. **DLC**—Discussion of results obtained by author during 1912–13 expedition to Bossekop (*see* 4J–46 and 4J–47, Oct. 1953, *MAB*). Four types of evidence contribute to knowledge of physical nature of aurora: 1) geographic distribution, 2) diurnal variation, 3) height and structure and 4) comparison of spectra with that of electrical discharges in gases. Equipment used by author to resolve the 4th point is described and a number of lines identified as corresponding to those of atomic nitrogen are tabulated and discussed. *Subject Headings:* **1. Auroral physics 2. Auroral spectra 3. Auroral nitrogen lines 4. Bossekop, Norway.**—*M.R.*

1916

5C–23 551.594.51

Vegard, Lars, **Nordlichtuntersuchungen über die Natur der kosmischen Strahlen, die das Nordlicht hervorrufen.** [On the nature of the cosmic rays that induce the aurora.] *Annalen der Physik*, 50(16):853–900, **1916.** 6 figs., tables, refs., eqs. **DLC**—A major contribution to the theory of aurora and magnetic storms, based on Bossekop (1912/13) results, with respect to geographic distribution, diurnal variations, relation to magnetic storms, electrostatic effects, height, structure and spectra of aurora, etc. It was concluded that the aurora only represents a small portion of the energy which goes into accompanying magnetic storms, though the center of magnetic disturbance coincides with auroral zone. Auroras, because of height and sharpness of lower boundary and small depth of luminescent zone must be caused by α not β particles, with positive and negative particles travelling in neutral bundles. *Subject Headings:* **1. Auroral theories 2. Vegard's theory 3. Auroral energy.**—*M.R.*

1917

5C–24 551.594.5

Störmer, Carl, **Corpuscular theory of the aurorae borealis.** *Terrestrial Magnetism and Atmospheric Electricity*, 22(1,3):23–24; 97–112, March, Sept. **1917.** 12 figs., plates, refs., eqs. **DWB**—Refers briefly to work of Goldstein (1881), Paulsen (1894), Birkeland (1896) and Arrhenius (1900). Beginning in 1904, the author undertook to determine mathematically the trajectories of electric corpuscles in the magnetic field of the earth in an effort to discover the principle features of auroras and magnetic storms. This paper is a summary of the theoretical work carried on from 1904 to 1912. *Subject Headings:* **1. Auroral theories 2. Corpuscular theory.**—*M.L.R.*

5C–25 551.594.5

†Vegard, Lars, **Bericht über die neueren Untersuchungen am Nordlicht.** [Report on new investigations of auroras.] *Jahrbuch der Radioaktivität und Elektronik*, Leipzig, 14(4):383–465, Dec. **1917.** 7 figs., 9 tables, 6 plates, 86 refs., eqs. **DCI-T**—A complete survey of knowledge of auroras and auroral theory from the earliest scientific works (1733) to date. Theories are classified according to 8 categories, and the greatest emphasis is given to the cosmic radiation theory which is based on Birkeland's and Störmer's hypotheses. In using the term cosmic radiation the author does not have the same concept as we do today, but means merely particles of various kinds from the sun. *Subject Headings:* **1. Auroral research 2. Auroral theories.**—*M.R.*

1919

5C–26 551.594.51

Slipher, V. M., **On the general illumination of the sky and the wave length of the aurora line.** *Astrophysical Journal*, Chicago, 49(4):266–275, May **1919.** refs. **DLC**—Since everyone of about 100 spectrograms made at the Lowell Observatory during the preceding 3½ years recorded the chief auroral line, the author concludes that the spectrograph gives direct evidence of the existence of permanent auroral illumination of the night sky. The measurement of one of the earlier plates taken with low dispersion indicates a larger wave length for the chief auroral line than the commonly accepted λ 5571. Additional measurements on plates with high dispersion gave mean value for the wave length of λ 5578.05. The new value of the wave length has not yet led to the identification of the chemical substance involved. *Subject Headings:* **1. Green auroral line 2. Lowell Observatory, Flagstaff, Ariz.**—*M.L.R.*

1920

5C–27 551.594.5:550.38

Chree, Charles, **Magnetic storms and aurora.** *Nature*, London, 73:101, Nov. 30, **1905**; 75:367, Feb. 14, **1907**; 100:344, Jan. 3, **1918**; 105:136–138, 170. April 1, **1920.** Titles vary slightly. **DLC**—These brief reports by various authors deal with auroras and/or magnetic storms observed at Kew Observatory, Stonyhurst College Observatory and Eskdalemuir. The magnetic storm associated with the aurora of March 7–8, 1918 may have been a repetition (after three 27-day intervals) of the storm of Dec. 16–17, 1917. The magnetic storm of March 22–23, 1920 observed at Stonyhurst was coincident with a sunspot group which appeared between March 16 and 29. *Subject Headings:* **1. Auroral magnetic relationships 2. British Isles. I. Cortie, A. L. II. Mitchell, A. Crichton.**—*M.L.R.*

5C–28 551.594.51:523.78

Culp, H. Willard, **Theories relating to aurorae.** *Popular Astronomy*, Northfield, Minn., 28(8):499–500, Oct. **1920.** **DLC**—"Auroral phenomena are the direct products of 'storms' on the sun." Disintegrating explosions of atoms in the sun, which form prominences in the corona, if strong enough, will throw its final atoms (electrified hydrogen and possibly helium) to the earth. A large

prominence was observed during the total solar eclipse of May 28–29, 1919 and on June 1 an aurora was seen in various parts of the U.S. Colors of aurora are due to gases as can be proved in the laboratory by passing an electric charge through gas in a tube. Examples are cited to prove and disprove the theory that the earth must be at or near one of the equinoxes in order to be bombarded successfully by corona streamers. *Subject Headings:* **1. Auroral theories 2. Solar eclipses.**—*M.L.R.*

1921

5C–29 551.594.5:550.38

Cortie, A. L., **Aurora, magnetic disturbance, and sun-spots.** *Nature*, London, 108(2713):272, Oct. 27, 1921. **DLC**—A magnetic disturbance was recorded at Stonyhurst College Observatory on Sept. 28–29 (aurora had been observed at Norman Lockyer Observatory on same day). Author considers this to be a return of the great disturbance of May 12–21, others being on June 6–10, July 7–9, Aug. 3–5, Sept. 2 and Sept. 28–29, all occurring in accordance with the solar rotation period. Another sequence of disturbances was observed from May 21 to Oct. 5 (June member missing). There was no active disturbance on the sun in most of these cases, but author does not believe this weakens the connection between solar activity and terrestrial magnetic disturbances. He offers two explanations for magnetic disturbances when there is an absence of sunspots or other surface phenomena of the sun: 1) an area on the sun may seemingly remain continuously or recurrently active for several solar rotations, even after the disappearance of the original solar disturbance and 2) "it may be that clouds of electrons discharged from a very active region on the sun remain undiffused for a considerable period." *Subject Headings:* **1. Auroral magnetic relationships 2. Auroral solar relationships.**—*M.L.R.*

1922

5C–30 551.594.51:551.521.4

Rayleigh, (Robert John Strutt) Lord, **A photographic spectrum of the aurora of May 13–15, 1921 and laboratory studies in connection with it.** *Royal Society of London, Proceedings, Ser. A*, 101(709):114–124, May **1922.** fig., plate, refs. **DLC.** Also: **A study of the presence or absence of nitrogen bands in the auroral spectrum.** *Ibid.*, 101(711):312–315, July, **1922.** 2 tables, refs. **DLC**—A photograph of auroral spectra obtained on the night of May 14, 1921, showing negative bands of nitrogen as well as the green auroral line of unknown origin, and laboratory photographs of the negative band of nitrogen are reproduced for comparison. Auroral spectra are also discussed in relation to upper atmosphere. Assuming that helium is the main constituent above 130 km, it is difficult, on the hypothesis of positive ray excitation, to explain its absence from the spectrum of this particular aurora (reached to 470 km at Oslo). Suggests that true nature of excitation of aurora is unknown. The second paper is the result of an attempt to determine if the ordinary night sky was to be classed with the aurora. Numerous photographs, taken near Lerwick in the Shetlands, which showed the green auroral line usually showed the nitrogen band, but somewhat weaker. "In this respect the Shetland photographs stand between those of the world-wide aurora of May 13–14 and the ordinary night sky in the south of England." Photographs of the light of the night sky made at Terling, Essex showed the green line, but there was no trace of nitrogen bands. *Subject Headings:* **1. Auroral spectra 2. Green auroral line 3. Night airglow spectrum.**—*M.L.R.*

1923

5C–31 551.594.51

†Babcock, Harold D., **A study of the green auroral line by the interference method.** *Astrophysical Journal*, 57(4):209–221, May **1923.** table, plates, refs. **DLC**—Refers briefly to work of Rayleigh and Slipher on the green auroral line. Then describes investigations at Pasadena and Mount Wilson and presents results of new measurements of the wave length of the green line by the interference method. The surface brightness of the diffuse green auroral line was found to be 10^{-8} times that of the green radiation from a mercury arc in a vacuum. By means of Fabry-Perot interferometers, the wave length was found to be 5577.350±.005 I. Å. The plates show photographs of interference rings from green auroral line and from artificial sources. *Subject Headings:* **1. Green auroral line 2. Auroral spectra 3. Interference method.**—*M.L.R.*

1925

5C–32 551.594.51

Burns, Gavin J., **The green auroral line.** *British Astronomical Association, Journal*, 36(2):64, Nov. **1925. DLC**—Refers briefly to paper by McLennan and Shum in the *Royal Society, Proceedings* (*see item* 5C–33) in which they describe experiments to determine the origin of the auroral line 5578 and to paper by H. D. Babcock in the *Journal* (*see item* 5C–31) who reports measuring the wave-length of this line and finding it to be 5577.350±.005. *Subject Headings:* **1. Auroral spectra 2. Green auroral line.**—*M.L.R.*

5C–33 551.594.51

†McLennan, J. C. and Shrum, G. M., **On the origin of the auroral green line 5577A, and other spectra associated with the aurora borealis.** *Royal Society of London, Proceedings, Ser. A*, 108(747): 501–512, July **1925.** fig., table, 2 plates, numerous refs. **DLC**—The introduction refers briefly to various men who have studied the aurora and problems associated with it. Then the authors describe their apparatus, and the various experiments carried out. A new line, λ 5577.35±0.15 Å, was found while studying the effect of large admixtures of helium or of neon on the spectrum of oxygen. Evidence is given to identify this line with the auroral green line λ 5577.350±.005 Å. The possibility of metastable helium acting as the exciting agent in the auroral spectrum is discussed. The plates show the new line clearly. *Subject Headings:* **1. Green auroral line 2. Auroral spectra.** —*M.L.R.*

1926

5C–34 551.594.51:523.746

Archenhold, F. S., **Nordlichter und Sonnenflecke.** [Aurora and sunspot.] *Das Weltall*, Berlin, 26(3):33–34, Dec. **1926.** 5 figs. (preceding p. 33). **DLC**—An attempt to link the auroras of Sept. 15 and Oct. 15, 1926 (others were observed in Germany on Jan. 26 and March 5, 1926) with sunspot groups observed at approximately the same time. It is not known whether the solar faculae or the sunspots are most closely associated with these intense auroras. Photographs of both are shown. The two photographs of auroras on Sept. 15, 1926 were made by CARL STÖRMER in Bygdö and are described by him on p. 34. The sunspot and faculae photographs by ARCHENHOLD are for Oct. 10 and 11, 1926 and were made at Treptow Observatory, Germany. *Subject Headings:* **1. Auroral solar relationships 2. Norway 3. Germany. I. Störmer, Carl.**—*M.R.*

5C–35 551.594.5:523.73

Burns, Gavin J., **Aurorae and rotation of the sun.** *British Astronomical Association, Journal*, 36(6):185–186, March **1926.** table. **DLC**—Since it had been found that between 1916 and 1921 auroras were much more frequent during one half of the sun's rotation than during the other half, this study was made to see if the same held true previous to 1916. The following records were used: 1) that kept by BACKHOUSE (*see* 4J–36, Oct. 1953, *MAB*) at Sunderland from 1860 to 1899, 2) Yearbooks of the Norwegian Meteorological Institute for 1900 to 1911 and 3) the British Astronomical Association reports for 1912 to 1921. A table shows the number of auroras observed in each 10-year period in each quarter of the sun's rotation (using Carrington's period of rotation). "The inference is that there was always some definite part of the surface of the sun which was especially active in causing aurorae from 1860 to 1921." *Subject Heading:* **1. Auroral solar relationships.**—*M.L.R.*

5C–36 551.594.51:551.510.535

McLennan, J. C., **The spectrum of the aurora and the constitution of the upper atmosphere.** *Royal Institution of Great Britain, Proceedings*, 25(120):125–141, **1926.** 21 figs. (incl. plates), table. **DLC**—Reviews work of RAYLEIGH, SLIPHER, VEGARD, BABCOCK, the author and others. A table summarizes VEGARD's investigation of the auroral spectra. Negative bands λ 4708, λ 4278, and λ 3914 Å in auroral spectra are evidence of the existence of nitrogen in the upper atmosphere (80–150 km); the famous green line λ 5577.35 Å is evidence of the existence of oxygen. *Subject Headings:* **1. Auroral spectra 2. Upper atmosphere composition.**—*M.L.R.*

5C–37 551.594.51

Vegard, Lars, **The origin of the red colour of the aurora of January 26, 1926.** *Norske Videnskaps —Akademi i Oslo. I. Matematisk-naturvidenskapelig Klasse, Avhandlinger*, No. 2, **1926.** 5 p. 2 figs. **DLC**—Spectrograms of this aurora taken at Oslo and Tromsø showed an intense red line. Measurements of the Tromsø plate gave a wave length of 6323.3 Å. The line on two other plates taken at Tromsø (winter of 1923–24) had wave lengths of 6321.6 and 6322.4 Å. The average was 6322.4 Å. Author believes that the red line 6323 is the limiting aspect of the band N_3. *Subject Headings:* **1. Auroral spectra 2. Red auroral line.**—*M.L.R.*

5C–38 551.594.51:550.38

Vegard, Lars, **The spectrum of the recent aurora.** *Nature*, London, 117(2940):356, March 6, **1926.** **DLC**—Striking feature of aurora of Jan. 26 was its intense red color which spectroscopic analysis showed to be due mainly to one single sharp line in the red, about λ 6323 Å.U. The prominent red line had been recorded on two previous occasions and its mean wave length determined to be 6322.4 Å. VEGARD's note followed a report in *Nature* (117, (2936):208, Feb. 6, 1926) of the largest magnetic storm in five years recorded by the magnetographs at the Royal Observatory, Greenwich on Jan. 26. *Subject Headings:* **1. Auroral spectra 2. Auroral magnetic relationships 3. Red auroral line.**—*M.L.R.*

1927

5C–39 551.594.51

Cario, Günther, **Die Wellenlänge der grünen Nordlichtlinie.** [Wave length of the green auroral line.] *Zeitschrift für Physik*, 42(1):15–21, **1927.** table, 13 refs. **DWB**—The green spectral line of neutral oxygen was found to be 5577.348±0.005 Å, which is identical with green auroral line. The method of measurement is described in detail. *Subject Headings:* **1. Auroral spectra 2. Green auroral line 3. Auroral oxygen lines 4. Auroral wave length measurement.**—*A.A.*

5C–40 551.594.51

McLennan, J. C. and McLeod, J. H., **On the wave-length of the green auroral line in the oxygen spectrum.** *Royal Society of London, Proceedings, Ser. A*, 115(772):515–527, Aug. **1927.** 4 figs., table, plate, 6 eqs. **DLC**—Mentions briefly the work of RAYLEIGH, SLIPHER, VEGARD, BABCOCK and earlier work of MCLENNAN and his associates. The purpose of the present study was to determine precisely the wave length of the oxygen green line. A Fabry-Perot interferometer and Babcock's technique were used. For the actual determination of the wave length of the oxygen green line, the wave length used as a standard for comparison was $\lambda = 5586.764$ I.Å. The present work confirms that of MCLENNAN and SHRUM (*see item* 5C–33). The wave length given by BABCOCK (*see item* 5C–31) was 5577.350 I.Å, the value the authors got was 5577.341 I.Å, a difference of only 0.009 Å. *Subject Headings:* **1. Green auroral line 2. Interference method 3. Auroral wave length measurement.**—*M.L.R.*

5C–41 551.594.51

McLennan, J. C., McLeod, J. H. and McQuarrie, W. C., **An investigation into the nature and occurrence of the auroral green line λ 5577 Å.** *Royal Society of London, Proceedings, Ser. A*, 114(766): 1–22, Feb. **1927.** 6 figs., 3 tables, 5 plates. **DLC**—An investigation into the nature and occurrence of the auroral green line 5577 Å. The apparatus is described and illustrated. Experiments were made using oxygen and oxygen mixed with various proportions of helium, the enhancement of the line was investigated and the magnetic or Zeeman effect of the green line was studied. The following results were noted: 1) the green line occurred in pure oxygen with greatest intensity at a pressure of 2 mm of mercury, 2) the intensity increased with the strength of the current in the discharge tube, 3) the line is due to oxygen and not to any impurity in the discharge tube, 4) it appears with greater intensity when the oxygen is mixed with helium, neon or argon, 5) a marked increase in intensity was observed when the oxygen was mixed with argon and 6) the Zeeman effect was observed but with some difficulty, a close doublet being seen. *Subject Headings:* **1. Auroral spectra 2. Green auroral line.**—*M.L.R.*

5C–42 551.594.51

Vegard, Lars, **Spectrographic observations of the second green line of the auroral spectrum.** *Norske Videnskaps-Akademi i Oslo. I. Matematisk-naturvidenskapelig Klasse, Avhandlinger*, No. 2, **1927.** 6+p. table, plate, refs. **DLC**—Contains a reproduction of two spectrograms and a table giving the wave length determinations from the two spectra. The first spectrogram, obtained after an exposure of 40 northlight hours, showed for the first time a second green line the existence of which the author had reported earlier. The second spectrogram was secured after a sensitizer had been obtained. The second green line appeared to be made up of a group of lines. The wave length of the second green line could not be determined. *Subject Headings:* **1. Auroral spectra 2. Green auroral line.**—*M.L.R.*

1928

5C–43 551.594.5:550.38

*Chree, Charles, **Magnetic disturbance and its relation to aurora.** *Australasian Antarctic Expedition, 1911–1915, Scientific Reports, Ser. B*, v. II, Pt. 2:195–331, **1928.** numerous tables. **DCI-T**—The first 3 chapters contain numerous tables of magnetic data from Cape Denison and Cape Evans and detailed analyses of these data. Chap. IV, Aurora and magnetic disturbance (p. 285–328) contains references to specific auroras and accompanying magnetic disturbances with the auroral and magnetic characters assigned. Tables of auroral and magnetic hourly characters, expectation of magnetic disturbance during hours when aurora were visible and invisible and occasions of brighter auroras are included. *Subject Headings:* **1. Auroral magnetic relationships 2. Antarctica.**—*M.L.R.*

5C–44 551.594.51

McLennan, J. C., **The aurora and its spectrum.** *Royal Society of London, Proceedings, Ser. A*, 120(785):327–357, Sept. **1928.** 24 figs., 9 tables, refs. **DLC**—The polar aurora is described and an account given of observations of its spectrum. The non-polar or night-sky spectrum is then described in relation to the band spectrum of nitrogen. The conditions for exciting the 5577 Å line

in the spectrum of atomic oxygen are then described, together with its identification with the auroral green line. The position of the green line in the term scheme of oxygen is fully discussed and an account given of investigations on electric transition by means of the Zeeman effect. Finally, an account is given of investigations of intensity of this line from which a maximum intensity is found between one and two a.m. *Subject Headings:* **1. Auroral spectra 2. Auroral spectroscopy 3. Zeeman effect.**—*Physics Abstracts, No. 487, 1929.*

1929

5C–45 551.594.5:550.38

Blanchet, G. H., **Remarks on magnetism and the aurora.** *Royal Astronomical Society of Canada, Toronto, Journal,* 23(6):291–292, July/Aug. **1929. DLC**—The station at Tavane (on the west shore of Hudson Bay) is practically on the line of no variation. An intermittent magnetic disturbance was caught the latter part of Feb. and on the nights of Feb. 26 and 27 the author observed the most brilliant auroral displays he had ever seen. Instead of the usual narrow band, these displays took the form of streamers. *Subject Headings:* **1. Auroral magnetic relationships 2. Tavane, Canada.**—*M.L.R.*

5C–46 551.594.51

Störmer, Carl, **The spectrum of sunlight aurora as compared with the spectrum of lower aurora in the earth's shadow.** *Nature,* London, 124(3120):263–264, Aug. 17, **1929.** 2 figs. **DLC**—Using spectrograms secured during aurora displays of March 15–16 (2 spectrograms) and April 16–17, 1929 (about 70), the author confirms previous observations that the green auroral line 5577 is stronger for the aurora in the earth's shadow than for high sunlit aurora as compared with the lines of ionized nitrogen 4728 and 3914. There was no indication of helium or hydrogen in the spectrum of high rays. One fig. shows the situation of the March 15–16 aurora compared with the position of the earth's shadow and the other is a reproduction of spectrograms. *Subject Headings:* **1. Auroral spectra 2. Sunlit auroral spectra 3. Green auroral line.**—*M.L.R.*

1930

5C–47 551.594.51

Chapman, Sydney, **On the solar ultra-violet radiation as the cause of auroral and magnetic storms.** *Royal Astronomical Society, London, Monthly Notices, Geophysical Supplement,* 2(6):296–300, April **1930.** refs. **DLC**—A criticism of the theory of MARIS and HULBURT (*see* 5C–51). The UV-radiation theory fails to account for auroras because the speed of the corpuscles (10 km/sec) is too small and the theory does not explain the extreme thinness of auroral curtains and streamers. The theory also fails to explain how magnetic storms are produced. CHAPMAN favors the corpuscular theory. *Subject Headings:* **1. Auroral theories 2. Ultraviolet light theory 3. Hulbert-Maris theory.**—*M.L.R.*

5C–48 551.594.51

Frerichs, Rudolf, **The singlet system of the oxygen arc spectrum and the origin of the green auroral line.** *Physical Review,* 36(3):398–409, Aug. 1, **1930.** 2 figs., 5 tables, refs. **DLC**—The oxygen arc spectrum has been investigated under varied conditions in the extreme ultraviolet. A number of observed lines have been arranged in the singlet system of terms. The values of the low terms $^1D_2$ and $^1S_0$ have been fixed. *Subject Headings:* **1. Auroral spectra 2. Green auroral line.** —*Author's abstract.*

5C–49 551.594.51

Frerichs, Rudolf and Campbell, J. S., **The transverse Zeeman effect of the green auroral line; an experimental proof of the existence of quadrupole radiation.** *Physical Review,* 36(9):1460–1467, Nov. 1, **1930.** 2 figs., 2 tables, refs. **DLC**—The transverse Zeeman effect of the green auroral line was photographed. The pattern is of the type (1), 2/1, in complete agreement with the prediction made by RUBINOWICZ on the basis of the theory of quadrupole radiation. *Subject Headings:* **1. Auroral spectra 2. Green auroral line 3. Zeeman effect.**—*Authors' abstract.*

5C–50 535.33:551.594.51

McLennan, J. C. and Ireton, H. J. C., **On the spectroscopy of auroral green line radiation.** *Royal Society of London, Proceedings, Ser. A,* 129(809):31–43, Sept. 3, **1930.** 10 figs. **DLC**—Describes a spectrograph designed especially for this type of work. A compound lens by Ross and two specially corrected single lenses by MELLISH and HILGER are compared—the Mellish lens gave least dispersion, the Ross the least speed coupled with best definition and the Hilger was the fastest. Also describes tube for producing green auroral line in a mixture of argon and oxygen. *Subject Headings:* **1. Spectrographs 2. Green auroral line.**—*From Physics Abstracts, No. 473, 1931.*

5C–51 551.594.51 550.38

†Maris, H. B. and Hulburt, E. O., **A theory of auroras and magnetic storms.** *Physical Review*, 33(3):412–431, March **1929.** Also: Hulburt, E. O., **The ultraviolet light theory of aurorae and magnetic storms. Continued.** *Ibid.*, 36(10):1560–1569, Nov. 15, **1930.** 2 figs., 17 refs., 2 eqs. **DLC**—The authors develop an elaborate theory to account for auroras and geomagnetic disturbances, based on the assumption that blasts of UV radiation in the 500 Å–1000 Å bands are emitted by the sun during solar flares and the energy therefrom "blasts" the ionospheric (200 km) layers of the atmosphere to send ions up to 40,000 km. These ions produce a 10^6 amp. current parallel to the equator, resulting in a sudden magnetic field all over the earth. They also spiral back to the earth in the polar regions (25° from the magnetic pole) in 9 hours after leaving the equator producing the aurora which as "everyone knows" is more frequent before midnight than after. In the later article HULBURT makes some refinements in his theory to remove some of the discrepancies between theory and observation. The maximum number of ions falls into the top of the atmosphere in auroral zone at about 1 p.m. and takes till 6 p.m. to fall to 100 km, where a set of electrical currents is set up in the Arctic and Antarctic at 60°–70° lat. The former limits of the long and short free path ion banks agree, respectively with the observed lower boundaries of streams and diffuse forms of aurora 100 km and 85 km, respectively. *Subject Headings:* **1. Auroral theories 2. Magnetic storms 3. Ultraviolet light theory 4. Hulbert-Maris theory.**—*M.R.*

5C–52 551.594.51

Paschen, F., **Zur Kenntnis des Sauerstoff-Spektrums OI.** [On the knowledge of the oxygen-spectrum, OI.] *Naturwissenschaften*, 18(34):752, Aug. 22, **1930. DLC**—Discusses the oxygen triplet 6300, 6364 and 6391 Å found by HOPFIELD for the first time in laboratory experiments simultaneously with the green auroral line. For the discovery of these lines in the night sky spectrum see SOMMER (5C–54). *Subject Headings:* **1. Auroral oxygen lines 2. Experimental auroral spectra I. Hopfield, I. I.**—*A.A.*

5C–53 551.594.51

Rayleigh (Robert John Strutt), Lord, **Absolute intensity of the aurora line in the night sky, and the number of atomic transitions required to maintain it.** *Royal Society of London, Proceedings, Ser. A*, 129(811):458–467, **1930.** tables, refs. **DLC**—A standard instrument for measuring the green auroral light, calibrated and equipped with a special filter to isolate the green auroral line as nearly as possible, was used. Assuming the transmitted light to consist entirely of A5577, the brightness corresponding to the zero reading of the instrument is found to be 8.65×10^{-5} candles/sq.m. which is the upper limit in any source which gives this zero reading. The light transmitted by the filter consists partly of the green line and partly of continuous background, the former is usually estimated as 0.37. The brightness of the line then becomes 3.2×10^{-5} candles/sq.m. The energy required to maintain it is 6.4 ergs/sec/sq.m. and the number of atomic transitions required to supply this energy is 1.81×10^{12}/sec/sq.m. *Subject Headings:* **1. Green auroral line 2. Spectrographs.**—*From author's summary.*

5C–54 551.594.51

Sommer, L. A., **Rote Sauerstoffstrahlung am Nachthimmel.** [Red oxygen radiation in the night sky.] *Naturwissenschaften*, 18(34):752, Aug. 22, **1930. DLC**—Red radiation in night sky spectrum was found and is explained as $\lambda\ 6300 = 2p^3P_2 - 2p^1D_2$ and $\lambda\ 6363 = 2p^3P_1 - 2p^1D_2$ of OI. The quantum-theoretical explanation of the green auroral line is verified. Its excitation voltage is 4.17V, the dissociation energy is 4.17V. The dissociation energy of the oxygen molecule is 5.09 ± 0.01V. For the discovery in laboratory experiments see PASCHEN (5C–52). *Subject Headings:* **1. Night airglow spectrum 2. Auroral oxygen lines.**—*A.A.*

1931

5C–55 551.594.51

Boutaric, A., **Les aurores polaires.** [Auroras.] *La Nature*, Paris, 59(2855, 2860):337–341; 17–21, April 15, July 1, **1931.** 21 figs. **DLC**—The article discusses the method of auroral photography used by STÖRMER in Norway, with many fine auroral photographs illustrating the various types, a description and illustration of the Störmer camera and method of triangulation, the height of the aurora and accompanying magnetic phenomena. In Pt. 2 the Birkeland theory, model and analogy with cathode ray streams are described and illustrated and, lastly, the theoretical research of STÖRMER in spectroscopy and on the trajectory of auroral particles coming from the sun and entering the earth's magnetic field is reviewed. *Subject Headings:* **1. Auroral photography 2. Birkeland's theory.**—*M.R.*

5C–56 551.594.51

*Brüche, E., **Some new theoretical and experimental results on the aurora polaris.** *Terrestrial Magnetism and Atmospheric Electricity*, 36(1):41–52, March **1931.** 21 figs., refs., 4 eqs. **DLC**—

STÖRMER's method of calculating the motion of an electron under the influence of an elementary magnet, producing a field as nearly as possible similar to that of the earth, is described, and several theoretical paths are drawn, agreeing closely with photographs experimentally obtained. Experimentally obtained. Experimental support is also obtained for the assumption of presence of a ring current parallel to the magnetic equator as the explanation of the extension of auroras far south of the limit allowed by the original theory. *Subject Headings:* **1. Auroral physics 2. Experimental auroras 3. Ring current theory.**—*From Physics Abstracts, No.* 2769, 1931.

5C–57 551.594.5

Brüche, E., **Störmers Polarlichttheorie in Experimenten.** [Experiments on Störmer's auroral theory.] *Zeitschrift für Astrophysik*, Berlin, 2(1):30–69, **1931.** 41 figs., table, refs., 9 eqs. **DLC**—Results of experiments made with a ball-shaped magnet representing a model terrestrial globe, and with luminous 200-volt electronic radiation are reported and found to agree with STÖRMER's calculations. The theory and the experimental apparatus are described. Trajectories obtained are discussed in detail and shown in photographs and diagrams. *Subject Headings:* **1. Auroral theories 2. Störmer's theory 3. Experimental auroras.**—*G.T.*

5C–58 551.594.5:523.2 523.2:550.38

Hale, George E., **The spectrohelioscope and its work. Part III. Solar eruptions and their apparent terrestrial effects.** *Astrophysical Journal*, 73(5):379–412, June **1931.** 8 plates, table, refs. **DLC**—First part of paper is a selection from English, United States and French sources of descriptions of solar eruptions and accompanying magnetic storms occurring over a period of 70 years (1859–1930). Mean time interval between the beginning of the solar eruption and the outbreak of intense magnetic storm was about 26 hours. In the section "Theories of the aurora" the work of BIRKELAND, ARRHENIUS, STÖRMER, CHAPMAN and others is mentioned. *Subject Headings:* **1. Solar magnetic relationships 2. Auroral solar relationships.**—*M.L.R.*

5C–59 551.594.51

Kaplan, Joseph, **Excitation of the green auroral line.** *Nature*, London, 128(3225):304, Aug. 22, **1931. DLC**—Refers to paper on the light of the night sky (*Physical Review*, 38:1048–1051, 1931) and his report at the Pasadena meeting of the American Physical Society in which he reported the first effectively complete production of the auroral spectrum. "On many of the spectra which were photographed during the progress of the above mentioned experiments, it was thought that there were definite, though weak, indications of the green auroral line." In the present paper he describes more recent experiments, where oxygen is introduced into the tube in which the auroral spectrum was reproduced, to increase pressure. A photograph taken of the spectrum of the high pressure tube showed a fairly strong excitation of the green line. Author believes "that the process of excitation of the green lines is the same in both the high-pressure and low-pressure tube, but that at high pressure the green line is emitted because collisions with the wall or with nitrogen molecules are less probable in view of the diluting effect of the added oxygen." In this experiment the green line was excited *without* the use of rare gases. *Subject Headings:* **1. Green auroral line 2. Experimental auroral spectra.**—*M.L.R.*

5C–60 551.594.5:550.38

Røstad, A., **Über magnetische Störungen, die an südnorwegischen Nordlichttagen in Potsdam beobachtet wurden.** [Magnetic disturbances observed in Potsdam on days with auroras in southern Norway.] *Geofysiske Publikasjoner*, Oslo, 9(3), **1931.** 31 p. 28 figs., refs., eqs. **DLC**—A thorough study of the relation between the intensity of magnetic disturbances and the angular distance of the auroral band (observed at Oslo) from the magnetic pole (or axis) of the earth. Also considered are the disturbing force and its relation to various parameters, and the regularity of the 24 hour periodicity. Magnetic data for Potsdam and Tucson were used. The strong 24 hour periodicity has an average maximum at 20 h and a minimum in the late morning (at Potsdam). With increasing intensity of disturbances the maximum occurs earlier (16 or 17 h). With weak auroras the maximum occurs simultaneously at Potsdam and Tucson, but with intense auroras the difference is greater. The intensity of the disturbance and the time, angle, variation in time and space, etc. are all correlated graphically to show the behaviors of these factors. *Subject Headings:* **1. Auroral magnetic relationships 2. Auroral latitude 3. Oslo, Norway 4. Potsdam, Germany 5. Tucson, Arizona.**—*M.R.*

1932

5C–61 551.594.51:535.33

Vegard, Lars, **Spectrographic observations of infrared lines in the auroral spectrum.** *Nature*, London, 129(3256):468, March 26, **1932.** fig. **DLC.** Similar article in *Naturwissenschaften*, 20(15):268–269, April **1932.** fig. Also; **Infra-red photography of aurora.** *Nature*, London,

129(3261):657, April 30, 1932. And Jevrons, W., **The auroral spectrum in the infra-red.** *Ibid.*, 129(3264):759–760, May 21, 1932. 6 refs. **DLC**—The first and second articles listed above deal with an auroral display at Tromsø on Feb. 4, 1932. Two small spectrographs were in operation, the spectrogram of one being reproduced. The spectrum in the infrared had the appearance of one strong band—λ 7883 and one weak one—λ 8095. The author concludes that more accurate determinations are necessary for exact interpretation of the infrared auroral lines. The third article reports that BAUER, working on kinematographic exposure of aurora, succeeded in Jan. in obtaining a picture of an aurora with infrared filter and plates sensible to infrared rays. JEVRONS replies to the March 26 article in *Nature*. He corrects VEGARD's numeration and eliminates another one of the three calculated bands. *Subject Headings:* **1. Auroral spectra 2. Infrared auroral line I. Jevrons, W.**—*M.L.R.*

5C–62 551.594.51

Vegard, Lars, **The temperature of the auroral region determined by the rotational series of the negative nitrogen-bands.** *Terrestrial Magnetism and Atmospheric Electricity*, 37(3):389–398, Sept. **1932.** 4 figs., 4 tables, refs., 4 eqs. **DLC**—Describes preliminary experiments which led to quantitative determination of temperature of auroral region. From intensity distribution in the R branch of the band 4278 of the negative nitrogen group, the temperature in the auroral region was found to be −33°C. *Subject Headings:* **1. Auroral zone temperatures 2. Auroral nitrogen bands.**—*M.L.R.*

5C–63 551.594.51

Vegard, Lars, **Wave-length of the green auroral line determined by the interferometer.** *Nature*, London, 129(3294):23, Jan. 2, **1932.** fig., 2 eqs. **DLC**—Describes equipment used at the North Observatory at Tromsø for this investigation. In this paper results from the observations of Oct. **29, 1931** are given. The wave length was calculated in two ways: 1) the vacuum wave length is found from the equation: $\lambda_N = \frac{2e\mu}{P_N}$ and 2) the comparison line was used directly and the length found by means of the equation: $\lambda_N = \frac{P_c \mu_N}{P_N \mu_c} \lambda_c (1+\epsilon)$. According to method (1), the wave length of the auroral line was λ = 5577.34A (I.U.) and for method (2) was λ = 5577.345A (I.U.). Concludes that, within the limit of error, the auroral green line is identical with that of the light of the night sky (*see* Babcock, 5C–32). *Subject Headings:* **1. Auroral spectra 2. Green auroral line 3. Interference method.**—*M.L.R.*

1933

5C–64 551.594.51:550.38

†Chapman, Sydney and Ferraro, V. C. A., **A new theory of magnetic storms.** *Terrestrial Magnetism and Atmospheric Electricity*, 36(2, 3):77–97, 171–186, June, Sept. **1931;** 37(2, 4):147–156, 421–429, June, Dec. **1932;** 38(2)79–96, June **1933.** 10 figs., 2 plates, refs., 172 eqs. **DLC**—Previous theories of magnetic storms and auroras are reviewed and difficulties which attend each discussed. The entire mechanism by which magnetic storms and auroras occur is then developed in the 11 chapters of this elaborate and now classic theoretical treatise. The basic assumptions are: a) that solar corpuscles form a curved stream that is electrostatically neutral but ionized, and which carries no appreciable current and does not produce a magnetic field; b) the curved stream reaches the earth on the evening side; c) the ions and electrons can move side by side and rectilinearly, without spiralling; d) the stream is slightly polarized and e) a current or ring of ions and electrons is formed around the earth in certain latitudes. The conditions of pressure, density, temperature, etc. in the earth's atmosphere resulting from the stream are elaborately detailed. Heat generated by the stream is dissipated in the atmosphere by (a) radiation and (b) ionization. The ring current can persist for several days but may be broken up by escaping charges. The charges must, then, be continually replaced in order for the ring current to persist. While this model does not deal extensively with the theory of the aurora, but rather with the origin of magnetic storms and other ionospheric conditions the treatment is basic to a quantitative evaluation of conditions producing and attending the aurora. *Subject Headings:* **1. Magnetic storms 2. Ring current theory 3. Champan-Ferraro theory 4. Auroral theories.**—*M.R.*

5C–65 551.5:016 551.594.5:016

†France. Météorologie Nationale and Société Météorologique de France, **Bibliographie Météorologique Internationale, Nouvelle Series,** v. 1–7, **1933–1939**; (unnumbered), 1946–. Last issue received, 1952, Fasc. 3. v. 1–6, pub. 1934?–1949?; v. 7, n.d.; issues for 1946– pub. 1946–. Title varies: v. 1–2, Bibliographie Internationale de Météorologie Générale; v. 3—Bibliographie Météorologique Internationale. **DLC, DWB**—Classified and partially annotated (in French) bibliographies covering periodical literature from all over the world. The material is arranged according to the U.D.C. scheme for meteorology (551.5). An author index and a subject index (with corresponding

U.D.C.) are included. References to aurora will be found under 551.594.5, 551.594.51, 551.594.52 and 551.594.53. 1952 issued by WMO as its OMM, No. 17. (*For fuller abstract see* 4.9–14, Sept. 1953, *MAB.*) *Subject Headings:* **1. Meteorological bibliographies 2. Auroral bibliographies.**—*M.L.R.*

5C–66 551.594.51

*Vegard, Lars and Harang, Leiv, **The auroral spectrum in the region of long waves. Recent results from the Auroral Observatory, Tromsø.** *Geofysiske Publikasjoner*, Oslo, 10(5), **1933.** 13 p. 2 figs., plate, 5 tables, refs. **DLC**—Using three types of spectrographs, several spectrograms of the auroral spectra in the infrared (extending as far as λ 8150) were obtained at the Auroral Observatory in Oct. 1932. Tabular data of results obtained with each spectrograph are presented. A summary of bands and lines in the region of long waves is also shown tabularly. Confirms previous statement that most weak lines and bands in the yellow, red and infrared regions formed part of the first positive group of nitrogen. An attempt to determine the relative intensities of lines 6302 and 6367 gave the value $\frac{I_{6302}}{I_{6367}}=1.65$. *Subject Heading:* **1. Auroral spectra.**—*M.L.R.*

1934

5C–67 551.594.5:551.521.4

Eropkin, D. I., **Interpretatsiia spektra poliarnogo siianiia i sveta nochnogo neba.** [Interpretation of the spectrum of aurorae and of the nocturnal sky light.]. (In: Vsesoiuznaia Konferentsiia po Izucheniiu Stratosfery, Leningrad, 1934, **Trudy,** p. 291–293, **1935.** 2 figs., 3 tables, 4 eqs.) Not trans. into English. **DLC**—Numerous spectral lines observed during auroras or in the night airglow are tabulated and theory reviewed. The relation of intensity of lines in relation to height above the horizon for various wave lengths is shown graphically (after the author). Current conditions regarding atomic or molecular structure of auroral zone of the upper atmosphere and origin and nature of particles inducing the glow as obtained from auroral spectral intensity, etc. are summarized. *Subject Headings:* **1. Auroral spectra 2. Night airglow spectrum.**—*M.R.*

5C–68 551.594.51:551.510.535

Gusev, P. I., **Poliarnye siianiia i verkhnie sloi zemnoĭ atmosfery.** [Auroras and the upper layers of the earth's atmosphere.] (In: Vsesoiuznaia Konferentsiia po Izucheniiu Stratofsery, Leningrad, 1934, **Trudy,** p. 283–289, **1935.** 6 refs., eqs.) Not trans. into English. **DLC**—An article reviewing the progress in study of the height, structure and composition of the atmosphere from 80 to 1000 km which has resulted from studies on the physics of the aurora and auroral spectra beginning with BIRKELAND's famous demonstration of the analogy between the aurora and laboratory models using cathode rays, and his conclusions regarding the corpuscular radiations from the sun, and later work of VEGARD in identifying auroral spectra lines. Theory which allows calculation of temperature in auroral layers is presented. MARIS and HULBURT's UV theory of aurora (*see* 5C–51) is also reviewed critically. Ionization and radiowave reflection from ionosphere also considered. *Subject Headings:* **1. Auroral spectra 2. Structure of outer atmosphere.**—*M.R.*

5C–69 551.594.51

*Harang, Leiv, **Filteraufnahmen von Polarlicht.** [Results of auroral photography with filters.] *Geofysiske Publikasjoner*, Oslo, 10(8), **1934.** 27+p. 14 figs., 4 plates, 10 tables, refs. **DLC**—Results of auroral photography with infrared, blue green, blue-violet, red, green and UV filters, analyzed according to type of aurora (homogeneous arcs, draperies, flaming auroras, etc.) are presented, including actual data for each photograph, numerous illustrative examples of pictures and spectra, and detailed explanation of equipment, methods of observation and analysis; polarization of aurora was also studied. Exposures varied from 10 sec to 3 min according to intensity of aurora. Only the photographs obtained with green and blue-violet filters were of any interest. *Subject Headings:* **1. Auroral spectral intensity 2. Auroral photography 3. Auroral polarization.**—*M.R.*

5C–70 551.594.51

Kaplan, Joseph, **Active nitrogen and the auroral spectrum.** *Physical Review*, 45(10):671–674, May 15, **1934.** 4 figs., 2 refs. **DLC**—A new afterglow of nitrogen has been photographed in the visible and the near ultraviolet. Its spectrum consists of the first-negative bands of N_2^+, first-positive bands of N_2 which originate on the vibrational levels $v'=15$, 16, 17, 18 and 19, and the second-positive group of nitrogen. The ordinary afterglow of nitrogen is also present but very weak. The spectrum of the afterglow is a very faithful reproduction of that part of the auroral spectrum which is due to nitrogen. The spectrum of the exciting discharge resembles that of the afterglow very closely. These facts are used as a basis for the hypothesis that the auroral spectrum is the superposition of a discharge spectrum. Attention is called to proposed extensions of the

experiment. *Subject Headings:* **1. Auroral spectra 2. Experimental auroral spectra 3. Auroral nitrogen lines.**—*Author's abstract.*

5C–71 551.594.5 550.38

Larmor, Joseph, **Aurorae, electric echoes, magnetic storms.** *Nature*, London, 133(3354):221–223, Feb. 10, **1934.** 7 refs., eqs. **DLC**—Reference is made to the results obtained by APPLETON and others regarding the complex connections between the optical and magnetic phenomena of the upper atmosphere, and consideration is given to electron densities required in the reflecting layer to provide reflection by rays following vertical or oblique paths. A scheme is next introduced in which it is assumed that the aurora is due to lasting local pulsations on a large scale, of long period, excited by a local cause, large enough and of abrupt type produced conceivably by arrest high up of an ionized torrent from outside sufficiently concentrated to require relief by propagation in waves. This could give the banded auroral curtains with spiralling transmission along the magnetic field. The splitting of the earth's magnetic field of the radiation into two cyclic components is examined for magnetic fields along and transverse to the waves and the methods by which these components could be verified. Finally, the effects of Hamiltonian group velocity and transition between energy levels are discussed. *Subject Heading:* **1. Auroral magnetic relationships.**—*Science Abstracts, No. 1539, 1934.*

5C–72 551.594.5:550.38

Rooney, W. J., **Auroral and earth currents.** *Terrestrial Magnetism and Atmospheric Electricity*, 39(2):103–109, June **1934.** 4 figs. **DLC**—A comparison of auroral observations and earth-current records from the College-Fairbanks station during the International Polar Year 1932–33 shows considerable agreement between the aurora and disturbances in the earth-current records. Coefficients of linear correlation from 0.71 to 0.76 were obtained from the records for 80 clear nights. Effects associated with brilliant isolated auroral displays at College are readily detected in the earth-current records at Tucson, Arizona, and in exceptional cases, in records obtained as far south as Huancayo, Peru. Oscillatory disturbances in the earth-current records and moving types of aurora, respectively, seem to show the highest degree of correlation. These results are at variance with comparisons of magnetic and auroral records which indicate a lack of relationship between the two phenomena. *Subject Headings:* **1. Auroral magnetic relationships 2. Alaska.**—*Author's abstract.*

5C–73 551.594.51

*†Vegard, Lars and Harang, Leiv, **The wave-length of the green auroral line determined by an interferometer method.** *Geofysiske Publikasjoner*, Oslo, 11(1), **1934.** 17+p. 4 figs., 7 tables, 3 plates, refs., 21 eqs. **DLC**—The interference method was used to measure the green line of aurora for comparison with similar measurements of night sky luminiscence made by BABCOCK (*see* 5C–31) in order to determine if in both types of luminiscence the same green line is being dealt with. Two quartz Fabry-Perot etalons, 2.5 and 5 mm thick, were used and a long series of measurements were made. Results are tabulated. Measurements with the 5 mm etalon gave mean of 5577.3445 ±.0027 Å, in good agreement with BABCOCK. Regards as proven "that the green line of night sky luminescence is identical with the strong green auroral line." Comparing the average wavelength in directions parallel and perpendicular to the ray streamers showed that "the Doppler effect cannot exceed 0.006Å." *Subject Headings:* **1. Green auroral line 2. Interference method 3. Doppler effect.**—*M.L.R.*

1935

5C–74 551.594.51

Harang, Leiv, **Filteraufnahmen von rot gefärbten Nordlichtern.** [Filterphotos of red colored auroras.] *Beiträge zur Geophysik*, 44(3):229–235, **1935.** 5 figs., refs. German and English summaries p. 229. **DLC**—Filterphotos in three spectral ranges of red colored aurora show that the red color at the lower edge is due to auroral lines at 6320 Å. *Subject Heading:* **1. Red auroral line.**—*Author's summary.*

5C–75 551.594.51

Kiepenheuer, K. O., **Bemerkungen zur Birkeland-Störmerschen Theorie des Polarlichtes.** [Birkeland-Störmer theory of auroras.] *Zeitschrift für Astrophysik*, 10(4):279–284, Aug. 31, **1935.** refs., 8 eqs. **DLC**—It is shown that the movement in the earth's magnetic field of corpuscular radiation which is in the mass neutral may be described by the STÖRMER equations when the density is sufficiently small (up to 1/cm³). For greater densities the work of CHAPMAN on the theory of magnetic storms leads to paths not consistent with the production of aurora. The penetration of the earth's atmosphere by the radiation considered is estimated, and plausible velocities of about 108 cm/sec give agreement with observation. *Subject Headings:* **1. Auroral theories 2. Birkeland-Störmer theory.**—*Science Abstracts, No. 4533, Nov. 1935.*

5C–76 551.594.5:550.38

Røstad, A., **Beziehungen der Nordlichterscheinungen zu den weltweiten magnetischen Störungen.** [Relation between auroral phenomena and world-wide magnetic disturbances.] *Geofysiske Publikasjoner*, Oslo 10(10), **1935.** 10 p. **DLC**—Author studied the widening of the auroral zone as a function of the intensity of perturbation. A fig. shows the relation between the angular distance θ of the most intense aurora from the earth's magnetic axis point and the magnitude of the perturbing vector measured at Rude Skov (near Copenhagen) and Potsdam. *Subject Heading:* **1. Auroral magnetic relationships.**—*Science Abstracts, No. 2495, 1935.*

5C–77 551.594.5

Scholz, Joachim, **Polarlichtuntersuchungen auf Franz-Josephs-Land.** [Auroral investigations at Franz Josef Land.] *Beiträge zur Geophysik*, 44(2):145–156, **1935.** 3 figs. **DLC**—A long series of measurements at two-minute intervals was obtained on two nights, when there was a cloudless sky and a calm, of the potential gradient, air-earth current and appearance of the aurora, and the individual values are tabulated. The potential gradient and current decrease 25 to 50% a short time before and during the occurrence of visible aurora, while with colored aurora the current may even be reversed. These changes were much greater than incidental seasonal changes. They are ascribed to the negative corpuscular stream which forms the aurora. As, however, the Heaviside layer serves as the outer conductor for the earth as a condenser this would produce a decreased potential gradient. The author therefore considers that the auroral stream contains positrons and electrons and the earlier arrival of the former causes the increased potential gradient. The different potential of the Heaviside layer on the sides near to, and away from, the corpuscular stream also plays a part. *Subject Headings:* **1. Auroral research 2. Atmospheric potential gradient 3. Franz Joseph Land, Arctic Ocean.**—*Science Abstracts, No. 2953, July 1935.*

5C–78 551.594.51:551.521.4

Vegard, Lars, **The aurora and night sky spectra and the upper atmosphere. Report on recent work.** *American Geophysical Union, Transactions*, 16:38–40, Aug. **1935.** 9 refs. **DLC**—Summary of work done since 1933 at Tromsø by the author, HARANG and TØNSBERG. More accurate determination of the wave length, especially in the region of long waves was undertaken. Results agree reasonably well with those found by BABCOCK (*see* 5C–31) for the green line from the night sky and with OI line ($^1S_0 - {}^1D_2$) discovered by MCLENNAN and his collaborators. Results of investigations of the line 6300 showed that it is an atomic line. (See *Geofys. Pub.*, 9(11), 1932; 10(4), 1933 and 10(5), 1933 for detailed report of work up to 1933.) *Subject Headings:* **1. Auroral spectra 2. Night airglow spectrum 3. Auroral wave length measurement.**—*M.L.R.*

5C–79 551.594.51:551.524.7

*Vegard, Lars and Tønsberg, Einar, **Continued investigations on the temperature of the upper atmosphere by means of bands appearing in the auroral spectrum.** *Geofysiske Publikasjoner*, Oslo, 11(2), **1935.** 14 p. 5 figs., 6 tables, 6 refs., 8 eqs. **DLC**—Four spectra of band 4278, obtained from Feb. 1933 to the end of March 1934, were used in the study. Method of determining the temperature was described. Average auroral band temperature of the excited molecules derived from the four spectrograms was 225.4°K or −47.6°C. *Subject Headings:* **1. Auroral spectra 2. Upper air temperatures.**—*M.L.R.*

1936

5C–80 551.594.51

*Currie, B. W. and Edwards, H. W., **On the auroral spectrograms taken at Chesterfield Inlet, Canada, during 1932–33.** *Terrestrial Magnetism and Atmospheric Electricity*, 41(3):265–278, Sept. **1936.** 8 figs., table, 12 refs. **DLC**—A study of 693 spectrograms obtained with successive exposures of about 1½ hours each night. A table shows wave-lengths, probable origins and frequency of occurrence of the radiations. "The radiations at Chesterfield . . . are characteristically auroral whether aurora is visible or not." Green line luminescence does not occur here as continuously as at lower latitudes. The effect of moonlight and twilight on red radiations was investigated and correlations between auroras, terrestrial magnetism and earth currents pointed out. *Subject Headings:* **1. Auroral spectra 2. Auroral magnetic relationships 3. Chesterfield Inlet, Canada.**—*M.L.R.*

5C–81 551.594.51

Heard, J. F., **The green line of the aurora.** *Royal Astronomical Society of Canada, Journal*, 30(2):55–56, Feb. **1936.** **DLC**—Refers to identification of the green line of aurora, the spectral line of wave-length 5577.35, by MCLENNAN and SHRUM in 1925 (*see* 5C–33) and to work of MCLENNAN and his colleagues in producing the green line in the laboratory. KAPLAN in a paper entitled "The excitation of the auroral green line by metastable nitrogen molecules" (*Physical Review*, 49:67, 1936) answers the question as to "What particular mechanism in the upper atmosphere is

effective in populating the $^1S_0$ metastable state with oxygen atoms and so producing the auroral green line." *Subject Headings:* **1. Auroral spectra 2. Green auroral line. I. Kaplan, Joseph.**—*M.L.R.*

1937

5C–82 551.594.51

Alfvén, Hannes, **Wie entstehen die Nordlichtteilchen?** [How do aurora particles originate?] *Zeitschrift für Physik*, 105:633–641, **1937.** fig., refs., eqs. **DBS**—The geographical distribution of the aurora shows that the energy of the incident particles may go up to 10^8eV. A mechanism for the emission from the sun of particles of this energy is suggested. It is shown that the magnetic field of the sun gives rise to an electric polarization, causing the potential at the equator to be 2×10^8V above that at the poles. If, but not unless, the magnetic field is disturbed, as in the neighbourhood of a sunspot, an electric discharge occurs, which is maintained on account of the sun's acting as a unipolar inductor. Particles of energy 10^8eV are thus liberated, and find their way to the earth. It is suggested that a similar process operating in the stars may be the origin of cosmic radiation. *Subject Headings:* **1. Auroral physics 2. Auroral solar relationships.**—*Science Abstracts, No. 3504, 1937.*

5C–83 551.594.51

Bernard, René, **Origine électronique des bandes de l'azote dans le spectre de l'aurore boréale. Determination de l'énergie des électrons excitateurs.** [Electronic origin of nitrogen bands in the aurora spectrum.] *Académie des Sciences, Paris, Comptes Rendus*, 204(12):993–995, March 22, **1937.** table, 2 refs. **DLC**—N_2 bands appearing in the aurora spectrum have been compared with those obtained experimentally from an electric discharge through N_2 at low pressure (BERNARD, 1937). The agreement shown indicates that the spectrum of the aurora borealis has its origin in electronic excitations. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands.**—*Science Abstracts, No. 2499, 1937.*

5C–84 551.594.5:550.38

Pushkov, N. V., Brunskovskaia, N. S. and Abramova, N. V., **Sopostavlenie magnitnoĭ aktivnosti i aktivnosti poliarnykh siianiĭ po nabliudeniiam v bukhte Tikhoĭ v 1932–1933 gg.** [Comparison of magnetic activity and activity of aurora borealis based on observation at Tikhaia Bay in 1932–1933.] *Meteorologiia i Gidrologiia*, No. 6:75–83, June **1937.** 6 figs., 2 tables, 9 refs. **DLC**—In order to establish the relationship between magnetic disturbances and aurora borealis, simultaneous observations of both phenomena were carried out at Tikhaia Bay (inside the area of maximum frequency of aurora borealis) from Oct. 15, 1932 to March 23, 1933. The findings were compared with records of previous observations. A statistical analysis of data from observations at Tikhaia Bay shows a common trend for both phenomena—the increase in intensity of aurora borealis coincides with increased magnetic activity. However, these findings are in contradition to results of observations at other stations (Cape Evans and Cape Adare in the Antarctic). The scarcity of data and absence of uniformity of methods of observation prevent the authors from any conclusions beyond vague formulas about some kind of relationship between the two phenomena. *Subject Headings:* **1. Auroral magnetic relationships 2. Tikhaia Bay, U.S.S.R.**—*C.K.*

5C–85 551.594.51

Vegard, Lars, **Intensitätsänderungen der grünen und roten Sauerstofflinien und das Auftreten des ϵ-Systems in Nordlicht und Nachthimmellicht.** [Intensity variations in the green and red lines and the appearance of the ϵ-systems in auroral and night sky light.] *Zeitschrift für Physik*, 106:108–131, **1937.** **DLC**—Interferometer measurements confirm that the 0 lines ($^1S_0-{}^1D_2$) and ($^1D_2-{}^3P_{012}$) occur in the auroral and night sky spectra, and that the red triplet is present both in sun irradiated and red aurorae (type A), its relative intensity increasing with light. It is shown that sunlight cannot directly cause a change in intensity. The red 6300 line can occur with a much higher intensity than the 5577 green line, indicating that the $^1D_2$ state can be excited directly. The changes in intensity can be explained on the basis of excitation processes proposed for the 0 lines according to which the large effect on the red triplet arises from excitation of O_3 by activated N_2. The presence of bands of the ϵ-system both in auroral light and in that of the night sky shows that the A (^3E) state of N_2 is present in high concentration. *Subject Headings:* **1. Auroral oxygen lines 2. Auroral intensity variations.**—*Science Abstracts, No. 3490, 1937.*

5C–86 551.594.51

†*Vegard, Lars and Tønsberg, Einar, **Variations of the intensity distribution within the auroral spectrum. Observations from the Auroral Observatory, Tromsø.** *Geofysiske Publikasjoner*, Oslo, 11(16), **1937.** 36+p. 5 figs., 7 tables, 2 plates, 29 refs., 22 eqs. **DLC**—Opens with a brief summary of auroral lines and bands and their interpretation. Results are summarized in a table. The

problems dealt with in this study of variations of intensity distribution within the spectra were: 1) variations of intensity distribution of vibrational bands of the same system, 2) intensity distribution within a certain rotational branch (important in connection with determination of temperature of the auroral region), 3) variation of relative intensity of nitrogen bands, 4) variations between red triplet OI($^1D_2 - {}^3P_{012}$) and green line OI($^1S_0 - {}^1D_2$) and 5) variation of the intensity of the green line 5577 relative to that of any of the nitrogen bands. The effects of altitude, type of aurora and exposure of aurora to sunlight on each of the above items are summarized. Three groups of spectrograms (according to period taken and equipment used) were the basis of the study. Extensive tabular data is included. *Subject Headings:* **1. Auroral spectra 2. Auroral intensity distribution.**—*M.L.R.*

1938

5C–87 551.594.51:551.510.535

De Kock, A. C., **Het Noorderlicht.** [Aurora borealis.] *Hemel en Dampkring*, 36(3):104–108, March **1938.** plate (6 auroral photos). **DWB**—The theories of HULBURT, BIRKELAND, VEGARD and STÖRMER on the origin of the aurora, conclusions as to the composition of the high atmosphere obtained from auroral spectra, laboratory models showing auroral rings and torus space, and the disturbance to radio communication caused by the great aurora of Jan. 25–26, 1938 are mentioned in this review article. *Subject Headings:* **1. Auroral theories 2. Upper atmosphere composition 3. Experimental auroras.**—*M.R.*

5C–88 551.594.51

Dufay, Jean and Gauzit, Junior, **Spectre de l'aurore du 25 janvier 1938.** [Auroral spectra of January 25, 1938.] *Académie des Sciences, Paris, Comptes Rendus*, 206(8):619–620, Feb. 21, **1938.** table, refs. **DLC**—Aurora was photographed at Saint-Genis-Laval with two spectrographs. A Ne spectrum was imposed beside the aurora on each plate. The first showed intense and well separated lines 6300 and 6363 Å of natural O and some feeble bands in the red. Exposures with second spectrograph were damaged. Table gives auroral lines compared with those given by VEGARD and with laboratory nitrogen. *Subject Heading:* **1. Auroral spectra.**—*From Science Abstracts, No. 1933, 1938.*

5C–89 551.594.51

Kaplan, J., **Production of aurora spectrum in the laboratory.** *Zeitschrift für Physik*, 109:750–752, **1938.**—The author describes the characteristic aurora afterglow which he has obtained in his discharge tube. The discharge shows a blue white color and the afterglow is a pronounced blue in contrast to the yellow color of the ordinary afterglow of N_2. Two photographs are reproduced showing the spectra of the aurora-afterglow obtained in a discharge tube and of an ordinary discharge. *Subject Headings:* **1. Auroral spectra 2. Experimental auroral spectra.**—*Science Abstracts, No. 4045, 1938.*

5C–90 551.594.51

Störmer, Carl, **Blue sunlit aurora rays and their spectrum.** *Nature*, London, 142(3606):1034, Dec. 10, **1938.** 2 figs., 2 tables, 4 refs. **DLC**—In the morning of Sept. 15 between 3h and 4h M.E.T. (sunrise in Oslo 5h 45m), blue sunlit aurora rays were observed. Simultaneous photographs from two stations showed that the blue part was lying from about 250 km to 650 km above the earth. Some good spectra were taken which were very similar to a most interesting spectrum taken by LORD RAYLEIGH of the aurora of May 14, 1921. The spectrum taken on Agfa Isopan plate ISS, exposure from 2h 35min to 3h 55min, of the summits of sunlit aurora showed rays among which the greater part were blue. *Subject Headings:* **1. Auroral spectra 2. Blue sunlit auroral rays.**—*E. V. Ashburn.*

5C–91 551.594.5

†*Vegard, Lars, **Die Deutung der Nordlichterscheinungen und die Struktur der Ionosphäre.** [Explanation of auroral phenomena and the structure of the ionosphere.] *Ergebnisse der Exakten Naturwissenschaften*, 17:229–281, **1938.** 10 figs., 9 tables, 109 refs., 14 eqs. **DWB**—This is a major monographic treatise on all phases of auroral physics and theory bringing the author's 25 years of work up to date and summarizing critically over a hundred works by other authors. The research embraced by this review falls into two categories: 1) the form, geographic distribution, time variations, relation to magnetic storms, earth currents and cosmic phenomena outside the earth's sphere of influence. These problems are kept uppermost in the author's presentation and are integrated by a single theory; 2) the physics of the aurora as determined mainly from recent research on the spectra of the aurora, radio-reflections from the ionosphere and the night airglow. The scores of auroral lines identified at the time of this work are tabulated and their meaning in

terms of the composition and ionization of the atmosphere are specified. Resulting theory as to origin of aurora is treated in detail. *Subject Headings:* **1. Auroral physics 2. Auroral theories.**—*M.R.*

5C–92 551.594.51

Vegard, Lars, **Altitude effects in the red part of the auroral spectrum and the two types of red auroras.** *Nature*, London, 14(3561):200, Jan. 29, **1938.** fig., table, 4 refs. **DLC**—Investigation to determine if there was an enhancement of the red oxygen line 6300 with increasing altitude. At Oslo, on the two nights of Oct. 11–13, 1937, four pairs of spectrograms were taken. For each pair, one was taken from the lower and one from the upper limit of the auroral streamers and for each pair the relative intensity of the red line increases from the lower to the upper limit; the average at the upper limit is 2.25 times that at the lower. The latter part of article deals with the altitude effects of the red line 6300 on the two types of red auroras, A and B. Type A has a tendency to be more intensively red towards the upper limits of the streamer and type B along the lower border. *Subject Headings:* **1. Auroral spectra 2. Red auroral line.**—*M.L.R.*

5C–93 551.594.51:551.510.535

†*Vegard, Lars, **Vorgänge und Zustände in der Nordlichtregion.** [Processes and conditions in the auroral region.] *Geofysiske Publikasjoner*, Oslo, 12(5), **1938.** 23+p. 4 figs., 4 tables, 2 plates, 34 refs., 5 eqs. **DLC**—A fundamental monograph giving the solution, or attempted solution, to a large number of problems concerning the physical properties of the aurora and the chemistry and physics of the ionosphere, from evidence gained through analysis of numerous auroral spectrograms in connection with magnetic, sunspot and radio propagation data. A few of the main points treated are: 1) the explanation of the types of the red (relative to green) bands (colors) at the lower and upper portions of rays, 2) the temperature (and density) distribution at 25–150 km and 3) the intensity distribution and changes therein (relative and absolute). Over 100 spectral bands were obtained by the author and his colleagues, and over 80 of these identified. New bands recently discovered are listed and discussed. *Subject Headings:* **1. Auroral spectra 2. Auroral physics 3. Ionospheric density 4. Temperature of the ionosphere.**—*M.R.*

5C–94 551.594.51

†Vegard, Lars, **Weak bands and atomic lines in the auroral spectrum.** *Geofysiske Publikasjoner*, Oslo, 12(8), **1938.** 10 p. 2 figs., table, 20 refs. **DLC**—Author refers to his work and that of Kaplan and Bernard on the ϵ-system in the auroral spectrum and that of the author and Tönsberg on atomic lines. The purpose of the present investigation was to determine if other nebular lines might appear in the auroral spectrum and particularly to determine if other forbidden lines resulting from transitions from the metastable ground-states of atomic nitrogen or oxygen were present in the auroral luminescence. The results are summarized in a table. *Subject Heading:* **1. Auroral spectra.** —*M.L.R.*

5C–95 551.594.51:551.524.7

Vegard, Lars and Tønsberg, Einar, **The temperature of the auroral region determined from band spectra.** *Geofysiske Publikasjoner*, Oslo, 12(3), **1938.** 9+p. 4 figs., 4 tables, 2 plates, 9 refs. 7 eqs. **DLC**—Report of "results of temperature measurements within the auroral region by means of the energy distribution within the negative nitrogen bands appearing in the auroral spectrum" based on two spectrograms obtained during the winter of 1935–1936 (exposure lasted from Oct. 15 to March 28) and that of 1936–1937 (exposure from Dec. 3 to April 10). Procedures are summarized. From the two spectrograms the mean temperature of the auroral region 95 to 125 km was determined as −35.5°C. These spectrograms and those of 1923–1924 and 1933–1934 gave a mean temperature of −38.7°C. The spectrograms are reproduced. *Subject Headings:* **1. Upper air temperatures 2. Auroral spectra.**—*M.L.R.*

5C–96 551.594.51

Walraven, F., **Het spectrum van het Noorderlicht.** [The spectrum of the aurora.] *Hemel en Dampkring*, 36(3):101–103, March **1938.** **DWB**—A spectrogram from the Tilanus Observatory at Amsterdam, made on the night of Jan. 25, 1938, is reproduced, showing the nitrogen bands 4278, 3914, 3583 and 3371 Å, the green oxygen line 5577 Å and the red oxygen lines at 6300 and 6364 Å. Two possible explanations of the red line based on the relative intensities and positions of these lines are offered. One solution involves splitting of an O_2 molecule in the presence of an activated N_2 molecule. The other a process of recombination which allows the red line to be formed independently of the green. *Subject Headings:* **1. Red auroral line 2. Auroral spectra 3. Recombination theory.**—*M.R.*

1939

5C–97 551.594.5:550.38

Bartels, Julius, **Das Nordlicht vom 24–25 Februar 1939 in Deutschland und die erdmagnetischen Störungen in Niemegk.** [The aurora on Feb. 24/25, 1939 in Germany and the geomagnetic disturbances in Niemegk.] *Beiträge zur Geophysik*, 55:193–203, 1939. 3 figs., refs. English summary p. 193. **DLC**—The author attempts to find a criterion in the magnetic records, indicating aurora near the zenith and gives a detailed description of the unusual aurora, as well as the course of geomagnetic declination, horizontal and vertical intensity at Niemegk. Short period magnetic fluctuations superposed on the general trend are caused by auroral activity. *Subject Headings:* **1. Auroral magnetic relationships 2. Niemegk, Germany.**—*A.A.*

5C–98 551.594.5:551.510.535

Dieminger, W. and Plendl, H., **Abnormale Erscheinung in der Ionosphäre während des Nordlichtes vom 24.–25. Febr. 1939.** [Abnormal phenomena in the ionosphere during the aurora of Feb. 24–25, 1939.] *Beiträge zur Geophysik*, 55(2):189–192, 1939. 3 figs., ref. **DLC**—Photographs of 80 m wave reflection during an unusual aurora, presented for the surface wave and the different F layers, show distinct disturbances and a general increase of the reflecting light. *Subject Headings:* **1. Auroral effects on radio propagation 2. Ionospheric disturbances 3. Radio wave reflection.** —*A.A.*

5C–99 551.594.5:550.38

Götz, Friedrich Wilhelm Paul and Penndorf, Rudolf, **Das Nordlicht vom 24./25. Februar 1939 in Arosa.** [Aurora of Feb. 24–25, 1939, in Arosa.] *Naturwissenschaften*, 27(15):241–243, April 14, 1939. 3 figs. **DLC**—A carefully detailed account of the conditions accompanying a brilliant auroral display which reached its greatest intensity at 11:28 p.m. on Feb. 24, and which reached 20° above the N horizon at 12:40 a.m. Feb. 25, just prior to the taking of the two vivid photos which are presented. A chart shows the course of the 3 magnetic elements at Collm Observatory, Leipzig, for the night in question, with arrows indicating times of greatest auroral activity so they may be correlated with the evident magnetic activity. The display was not visible in Norway but a magnetic disturbance (150 milliamperes) prevented telegraph communication between Norway and the Continent. *Subject Headings:* **1. Auroral magnetic relationships 2. Arosa, Switzerland.**—*M.R.*

5C–100 551.594.51

Holmes, M. C., **Earth's electric field and aurora.** *Franklin Institute, Journal*, 228(1):63–68, July 1939. fig., refs. **DLC**—Measurements of the electric gradient made on board the "Carnegie" showed a variation of field strength with latitude. Fig. illustrates distribution of electric charges with lines of force. Author proposes theory that the aurora represents ionization by the earth's electric field in a limited region and offers evidence to support the theory. *Subject Headings:* **1. Auroral theories 2. Ionization.**—*M.L.R.*

5C–101 551.594.51:551.510.536

Mitra, S. K. and Banerjee, A. K., **Fringe of atmosphere and ultra violet light theory of aurora and magnetic disturbances.** *Indian Journal of Physics*, Calcutta, 13(2):107–144, April 1939. 7 figs., 5 tables, 27 refs., 29 eqs. **DLC**—The paper is divided into two parts: 1) the fringe of the atmosphere and 2) the U.V. theory of the aurora. The fringe which exists beyond the limits of the upper atmosphere is regarded as containing molecules moving without collision and describing immense orbits. The height of this region of negligible collision is calculated to be 770 km. Molecular densities at different levels in the fringe are estimated and the merging of the fringe into interstellar space is regarded as taking place between 2,000 and 2,500 km above the earth. If account be taken of collisions between neutral particles and atoms or molecules excited to metastable states by incident solar radiation, then the spray region is found to extend to 14,000 km. These results are not quite in accordance with HULBERT's (1929, 1930) theory of auroras; the differences are discussed. In the second part, where the motion of an ion in the earth's magnetic and gravitational fields is investigated, differences with HULBERT's theory are also encountered. The authors consider however, that with increase of spectroscopic knowledge of the high atmosphere new facts may be revealed which would explain the discrepancies. *Subject Headings:* **1. Auroral theories 2. Ultraviolet light theory 3. Exosphere.**—*Science Abstracts, No. 3595, Sept. 1939.*

5C–102 551.594.51:551.510.535

Nicolet, Marcel, **Le problème atomique dans l'atmosphère supérieure.** [The atomic problem in the upper atmosphere.] *Belgium. Institut Royal Météorologique, Mémoires*, v. 11, 1939. 39 p. 3 tables, refs. Also in: *Ciel et Terre*, 55:257–292, 1939. **DWB**—The author identifies several types of atomic radiation in the auroral emission spectrum and analyzes their mechanisms. The study is based on observations reported by various authors which are interpreted in terms of atomic and molecular quantum properties. *Subject Headings:* **1. Auroral spectra 2. Upper atmosphere.**—*G.T.*

5C–103 551.594.51:550.38

Stagg, J. M. and Paton, James, **Aurorae and geomagnetic disturbance.** *Nature*, London, 143(3631):941, June 3, **1939.** **DLC**—From analysis of several cases of simultaneous auroral displays and magnetic disturbances observed at Fort Rae (Canada) during the International Polar Year 1932–1933 the authors conclude that, "at least in high magnetic latitudes there is a closer spatial association than has hitherto been supposed between the current system which produces the major short-period perturbations in the earth's field and the currents which manifest themselves as auroral arcs at heights mainly between 100 km and 115 km." *Subject Headings:* **1. Auroral magnetic relationships 2. Fort Rae, Canada.**—*M.L.R.*

1940

5C–104 551.594.51:550.38

Alfvén, Hannes, **On the motion of a charged particle in a magnetic field.** *Arkiv för Matematik, Astronomi och Fysik*, Stockholm, 27, Pt. A(22), **1940.** 20 p. 4 figs., refs. numerous eqs. **DLC**—Discussion of the problem of the motion of an electrically charged particle in a magnetic field, particularly in a dipole field. This problem is of great importance for the study of cosmic rays, aurora, magnetic storms, and probably also for the understanding of the solar corona. The motion of a charged particle in an inhomogeneous magnetic field under the influence of electrical forces, gravitation, etc. is treated as a perturbation of the simple motion in a homogeneous field. *Subject Headings:* **1. Magnetic field 2. Dipole fields 3. Auroral physics.**—*M.L.R.*

5C–105 551.594.51

Alfvén, Hannes, **A theory of magnetic storms and aurorae.** *K. Svenska Vetenskapsakademiens, Handlingar, 3rd Ser.*, 18(3, 9), **1939, 1940.** No. 3, 39 p. 12 figs., table, refs., 45 eqs.; No. 9, 39 p. 11 figs., table, refs., 19 eqs. **DLC**—In this series of articles the author has built up an elaborate theory and model of the solar-terrestrial magnetic field, erratic disturbances in the electric storms and currents, and magnetic disturbances arising from these electric disturbances. The aurora is one of the manifestations explained by this theory. It is supposed that high energy positive and negative particles (electrons and ions) are sent out from a sunspot area as a neutral polarized beam accelerated by the sun's magnetic field. This beam is divided on entering the earth's magnetic field, and is asymmetric on the day and night side, but symmetrical with respect to the 6h and 18h sides. Ring currents are generated, with zones of concentration and forbidden zones. The auroral arc occurs where the boundary of the forbidden zone intersects the earth. The boundary moves north and south over a narrow range because of the tremendous extra amount of energy required for the boundary to invade the forbidden zone. The theory is purported to explain the origin, polar distance, duration of initial phase, energy of particles, energy at sunspot, travel time from sun, time of maximum intensity, velocity of drifts, ion density, space charge in forbidden regions, auroral types, etc. The STÖRMER theory assumes particles hitting the earth's atmosphere at energies of 10^8 ev. whereas author's theory allows much lower energies (10^4 or 10^5 ev.). Objections to STÖRMER's and other (MARIS and HULBERT) theories are developed. A laboratory model of the current system and the auroral zone was also developed and is explained and illustrated. *Subject Headings:* **1. Auroral theories 2. Auroral physics 3. Alfvén's theory.**—*M.R.*

5C–106 551.594.51

Bernard, R., **Recherches sur les conditions d'excitation des divers systèmes de bandes de la molécule d'azote neutre et ionisée.** [Research on the conditions of excitation of various systems of bands of neutral and ionized nitrogen molecules.] *Annales de Physique, Ser. 11*, 13:5–77, Jan./Feb. **1940.** 23 figs., 12 tables, 2 plates, refs., 7 eqs. **DLC**—Describes method of spectral excitation by electronic shock. The experiment is used to determine energy levels in the band spectra of N_2^+. Makes possible precise determination of the excitation functions of bands N_2^+ and N_2 (2 P) and the assigning of a definite excitation potential to the N_2 bands in the aurora. Vegard-Kaplan bands can be excited by an access of A. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands.**—*M.L.R.*

5C–107 551.594.5:523.74

*Clayton, Henry Helm, **Auroras and sunspots.** *Terrestrial Magnetism and Atmospheric Electricity*, 45(1):13–17, March **1940.** fig., 7 tables, refs. **DLC**—Records from Blue Hill Observatory for a 55-year (1885–1939) period were basis for this study. Tables show the following: 1) maximum in March and Sept. and minimum in June and Nov., 2) a maximum of auroras one year after sunspot maximum, 3) maximum of spots in the central area of the sun one day before occurrence of aurora, 4) possibility that greatest area of spots in central zone of sun preceded aurora by 1–4 days, also that more brilliant aurora are preceded by larger spots, 5) that in order to produce auroras the area of spots passing the central meridian of the sun must increase in size as distance from center of disc increases and 6) that aurora occurs about 1.5 days after spot has crossed central meridian. Fig.

shows the position of all spot-groups on the day preceding the date of the auroras from 1931 to 1939. *Subject Headings:* **1. Auroral solar relationships 2. Auroral frequencies 3. Blue Hill Observatory, Mass.**—*M.L.R.*

5C–108 551.594.5:523.75

Flammarion, Gabrielle Camille and Quénisset, F., **Eruption solaire, perturbations magnétique et aurore boréale.** [Solar eruption, magnetic perturbations and the aurora.] *Société Astronomique de France, Bulletin*, 54:88–89, Jan. **1940. DLC**—Numerous reports from France, Belgium and Italy give details of this brilliant and unusual aurora on the evening of March 24, 1940. The author noted that the magnetic disturbance and the aurora followed immediately after the chromospheric eruption (March 20) on the sun, and 3 days before the passage of the spot over the central meridian of the sun (March 26). *Subject Headings:* **1. Auroral solar relationships 2. France.**—*M.R.*

5C–109 551.594.51:535.33:546.17

†*Rypdal, P. and Vegard, Lars, **The excitation functions of nitrogen bands and their bearing on auroral problems.** *Geofysiske Publikasjoner*, Olso, 12(12), **1940.** 20+p. 13 figs., 9 tables, 3 plates, 24 refs., 12 eqs. **DLC**—Report of an investigation "to give a quantitative determination of the 'true' excitation functions for the negative and the 1st and 2nd groups of nitrogen for low tensions from the excitation voltage and upwards to about 120 volts." The effective potentials are found by measuring the ignition potential for He used as a standard gas. The procedure and apparatus (shown in figs.) are also described. The ignition potential of the (O−O) band of the I.P.G. was 9.4, for the (O−ν'') series of the 2nd positive group was 13.4 and for the (O−O) band of the N.G. was 16.4. All results were in good agreement with previous measurements. Applying the above results to the average auroral spectrum, the energy of the electrons producing the aurora was found to be 29 volts. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands.**—*M.L.R.*

5C–110 551.594.51

Vegard, Lars, **On some recently detected important variations within the auroral spectrum.** *Terrestrial Magnetism and Atmospheric Electricity*, 45(1):5–12, March **1940.** 3 figs., 4 tables, 10 refs. **DLC**—Two spectrograms obtained from quiet auroral arcs during a display at Oslo on Oct. 18, 1939 indicate the existence of H_α ($\lambda = 6562.8$) in the upper atmosphere. Using other spectrograms (from Oslo and Tromsø), the variation of intensity with latitude and height is shown graphically and tabularly. *Subject Headings:* **1. Auroral spectra 2. Auroral spectrum variations.**—*M.L.R.*

1941

5C–111 551.594.51:535.33

Dufay, Jean; Gauzit, Junior and Techeng, Mao-lin, **Spectre de l'aurore du 1er mars 1941.** [Auroral spectra of March 1, 1941.] *Cahiers de Physique*, Paris, No. 1:59–64, June **1941.** 3 figs. table, 15 refs. **DLC**—In addition to oxygen lines (6300 Å, more intense than 5577 Å) and negative bands of nitrogen, band 4425 Å of the Vegard-Kaplan system and 2 bands of the first positive system of N_2 were identified. Two radiations at 4875 and 5206 Å were not identified. The last, very strong, has been observed before in the spectra of low latitude auroras; its origin is discussed. *Subject Heading:* **1. Auroral spectra.**—(*Trans. of authors' abstract*).—*M.L.R.*

5C–112 551.594.5:550.38

Gartlein, C. W., **Aurora and geomagnetism.** *American Philosophical Society, Proceedings*, 84(2):299–307, May **1941.** 5 figs., refs. **DLC**—Correlations are pointed out between the earth's magnetic lines of force and lines of equal auroral intensity, the positions of auroral arcs, and the angles of inclination of auroral rays to the horizon. Coronae appear always at the magnetic zenith for the time of observation. Relations between the auroral frequency curve, the sunspot cycle of 11 years and the solar rotation period of 27 days are discussed. A correlation diagram between auroral and magnetic character figures for the same 3 hr periods give a correlation coefficient of 0.63. Similar correlation with auroral intensity is shown by earth current activity. *Subject Heading:* **1. Auroral magnetic relationships.**—*Science Abstracts, No. 2045, Oct. 1941.*

5C–113 551.594.5

Götz, F. W. Paul and Casparis, Ph., **Das Nordlicht vom 18. bis 20. September 1941 in Arosa.** [The aurora of September 18–20, 1941 in Arosa.] *Zeitschrift für Angewandte Meteorologie*, 58(11): 337–351, 1941. **DLC**—Detailed description of various phases of this intense aurora, together with clear photos of the rays over and behind the mountains to the N and NW of Arosa, the intensity of 5577, 6300 and 6300/5577 Å lines (5 other bands were photographed and identified), the relation to the magnetic storm which coincided with the aurora and to sunspots, halos and cirrus cloud

formations. A table gives 11 cases of auroras (1937–1941) which coincided with halos observed at Arosa. *Subject Headings:* **1. Auroral magnetic relationships 2. Auroral spectra 3. Arosa, Switzerland.**—*M.R.*

1942

5C–114 551.594.51

Atkinson, R. d'E., **Note on Vegard's theory of the aurora.** *Royal Society of London, Proceedings, Ser. A*, 106(738):429–440, Oct. **1942.** refs., eqs. **DLC**—I. It is shown that the presence of solid nitrogen would not account for aurorae at great heights since (1) there probably cannot be a strong enough field to lift crystals; (2) the volume charge they would carry would be impossibly large if enough light were to be obtained, (3) the largest crystals that could by any means be lifted would probably be completely vaporized by one electronic impact, (4) solid nitrogen probably cannot emit a narrow line. II. The possibility of low enough temperature is disproved. III. The experimental evidence of VEGARD is shown to be inconclusive and the only other evidence directly antagonistic. IV. Two alternatives, in which the aurora is explained as a purely gaseous luminescence, are outlined and possibility that the gas might be oxygen instead of nitrogen (as far as 5578 is concerned) is discussed. *Subject Headings:* **1. Auroral theories 2. Vegard's theory.**—*Author's summary.*

5C–115 551.594.51:550.385

Cowling, T. G., **On Alfvén's theory of magnetic storms and of the aurorae.** *Terrestrial Magnetism and Atmospheric Electricity*, 47(3):209–214, Sept. **1942.** figs., refs., 6 eqs. **DLC**—Criticizes ALFVÉN's theory is which charged particles, repelled diamagnetically from the sun, are separated into electrons and ions on reaching the earth and then discharged to the geomagnetic poles. It is shown that diamagnetic repulsion prevents the particles from reaching the earth's atmosphere and that electrostatic forces prevent more than a slight separation of ions from electrons. A stream of ionized particles can reach the earth only if either the particles of energy are large enough or the main stream is so dense that the leading particles shield the body of the stream from diamagnetic repulsion. *Subject Headings:* **1. Alfvén's theory 2. Magnetic storms 3. Auroral physics.**—*Physics Abstracts, No. 471, 1943.*

5C–116 551.594.52:551.593.55

Elvey, C. T. and Farnsworth, Alice H., **Spectrophotometric observations of the light of the night sky.** *Astrophysical Journal*, Chicago, 96(3):451–467, Nov. **1942.** 13 figs., 2 tables, refs., eq. **DLC**—Spectrophotometric observations of the light of the night sky have been made for the stronger lines of the visual region of the spectrum to determine: 1) the variation of intensity with zenith distance to obtain a measure of the height of the auroral layer and 2) the curves of nocturnal variation of intensity. The variation of intensity with zenith distance indicates a height of 500 km for the auroral layer producing the red and green auroral lines, as well as the line of uncertain origin at 6560. This is greater than the height obtained for the infrared radiations, 125 km. Curves of nocturnal variation of intensity were obtained at Bosque Algere, Argentina; at Potrerillos, Chile; in the southern New England States; at the McDonald Observatory (Univ. of Texas). The sodium line is relatively constant through the night, with enhancement at evening and morning twilights. The green auroral line is relatively constant throughout the night and through both twilights. The reported maximum near midnight has not been confirmed. The red auroral line has remarkable twilight effects, the one in the evening lasting for three or four hours after the end of twilight and the one in the morning beginning two hours before dawn. Figs. show mean variations of intensity of the green auroral line 5577, the red auroral line 6400, the sodium line 5893 and the line of uncertain origin 6560 for Bosque Algere, Potrerillos and the southern New England States. *Subject Headings:* **1. Auroral spectra 2. Auroral intensities 3. Night airglow.**—*Partly from authors' abstract.*

5C–117 551.594.51

Waldmeier, M., **Die Nordlichter vom 25. Januar 1938 und 18. September 1941 und ihre solare Ursache.** [The auroras of Jan. 25, 1938 and Sept. 18, 1941 and their solar origin.] *Naturforschende Gesellschaft, Zürich, Vierteljahresschrift*, 87:253–267, **1942.** 4 tables, 8 refs. **DLC**—Detailed descriptions are given of the structure of these auroral displays as observed in Switzerland. Two systems of parallel rays inclined at 8° to one another are distinguished. A microphotometer trace is shown of a spectrogram secured in 8 hr on an *f*/1 quartz spectrograph. German and Dutch magnetic traces show large deflections in H and D which occurred simultaneously with outbreaks of luminosity in the 1938 aurora, but the 1941 auroral intensity showed no such correspondence with Swiss magnetic records. Both aurorae are ascribed to chronometric eruptions emitting particles at speeds of from 2000 to 750 km/sec. *Subject Headings:* **1. Auroral solar relationships 2. Switzerland.**—*From Science Abstracts, No. 2098, 1943.*

1945

5C–118 551.510:551.593.55 551.594.51:551.510

†*Vegard, Lars and Kvifte, G., **Spectral investigations of aurorae and twilight.** *Geofysiske Publikasjoner*, Oslo, 16(7), **1945.** 29 p. 12 tables, 3 plates, 39 refs. **DLC**—Chap. I contains an analysis and data for 36 spectrograms, most of them with a fairly high dispersion, taken at Oslo from 1941–1943. Chap. II presents a table showing 173 bands and lines (table published in 1941 showed only 148) with wavelength, intensity and interpretation; discussion of the interpretation and tables giving wavelengths and classifications for atomic oxygen and atomic nitrogen lines. Chap. III deals with the sodium D line in twilight. A table shows the hour of disappearance (τ) of the twilight D-emission and the corresponding hour angle (t) and height of the sun. Support is given to VEGARD's hypothesis that sodium atoms or ions from the sun pass into the atmosphere. Advances arguments against the meteorite hypothesis of CABANNES, DUFAY and GAUZIT. *Subject Headings:* **1. Auroral spectra 2. Twilight spectra 3. Upper air physics.**—*M.L.R.*

5C–119 551.594.5:551.590.25

*V'iunov, B. F., **Rol' meteoritnykh potokov v usloviiakh vozniknoveniia magnitnykh bur' i poliarnykh siianiĭ.** [The role of meteoritic showers in the occurrence of magnetic storms and auroras.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr. i Geofiz.*, 9(4):294–315, **1945.** 18 figs., 4 tables, refs. English summary p. 315. **DLC**—The author presents a large amount of tabular and graphic statistical data to support his theory that magnetic storms and auroras are not only dependent on solar flares but on meteoritic showers, and that this complex of phenomena is also reflected in the interdiurnal surface temperature and cloudiness. Data for period 1875–1939 as recorded at Slutsk (near Leningrad) are used (512 cases of aurora for 19 years and 1103 magnetic storms for 61 years). Since the periodicity of these meteoritic clouds is 19 years and a lesser period of 480 days, it is possible to predict auroral maximum and minimum for next 279 years. However, the 480 day period results in a variation of the maximum activity from spring to autumn and back to spring in the course of a decade or two. During periods of high auroral activity the author noted sub-normal temperature and cloudiness. *Subject Headings:* **1. Meteoritic showers 2. Auroras 3. Magnetic storms.**—*M.R.*

1947

5C–120 551.594.51:551.510.535

Alfvén, Hannes, **On the theory of the aurora.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 132–137. 5 figs., 3 refs.) **DWB**—An approach based on the importance of the electric field associated with an ionized beam from the sun. *Subject Headings:* **1. Auroral theories 2. Ionospheric variations.**—*M.R.*

5C–121 551.594.51:535.33

Bates, David R., Massey, H. S. W. and Pearse, R. W. B., **The aurora.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 97–105. 17 refs., 11 eqs.) **DWB**—Various systems discovered in auroral spectra are discussed and listed in detail. VEGARD's theories are reviewed and absent emission explained. Forbidden and permitted lines of N(I), O(I), O(II) and N(II) are also discussed. *Subject Headings:* **1. Auroral spectra 2. Auroral theories 3. Vegard's theory.**—*M.R.*

5C–122 551.594.51:535.33

Bernard, René, **Longueur d'onde de la raie NI ($^4S-^2P$) de l'azote atomique dans le spectre de l'aurore boréale.** [Wavelength of the NI ($^4S-^2P$) band of atomic nitrogen in the auroral spectrum.] (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 91–92. 5 refs.) **DWB**—Although VEGARD contends that the coincidence of observed and calculated wavelengths (3466.3 Å and 3466.5 Å respectively) that the author found was purely fortuitous, the author insists that this line can be identified positively as due to neon in auroral emissions. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands 3. Neon in atmosphere.**—*M.R.*

5C–123 551.594.51:535.33

Bernard, René, **Le spectre de l'hydrogène et de l'helium dans l'aurore boréale.** [The spectrum of hydrogen and of helium in the aurora borealis.] (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 93–97. 3 tables 2 refs.) **DWB**—Numerous observations of hydrogen, HeI, and HeII are reported and tabulated. Conclusion is that neutral He lines are well represented in the auroral spectrum, and that observation of a strong 4685 Å line, reinforced in the upper part of auroral rays, leads to belief that partially ionized helium exists at that altitude. *Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines 3. Auroral helium lines.**—*M.R.*

5C–124 551.521.4 551.594.51 535.33(09)

Chapman, Sydney, **The emission spectra of the night sky and aurorae.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 1–3, 3 refs.) **DWB**—An introduction to the conference and the 24 papers presented, wherein the author reviews the progress in the particular field of auroral or night sky spectroscopy from 1916, when VEGARD identified 3 strong lines in the auroral spectrum, to 1925 when MCLENNAN and SHRUM identified the 5577 Å line as a "forbidden" atomic oxygen line, LORD RAYLEIGH's work in that period, and the current contributions of the men doing work in ozone distribution (DOBSON and GÖTZ) and radio physics (APPLETON, TUVE and others). (*Same item as* 3.11–133, Nov. 1952, *MAB.*) *Subject Headings:* **1. Auroral physics research 2. Night sky spectroscopy 3. Ozone distribution 4. Night airglow 5. Auroral spectroscopy 6. Compendiums.**—*M.R.*

5C–125 551.594.51(09) 550.38

Chapman, Sydney, **Theories of aurorae.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 120–132. 3 figs., refs.) **DWB**—A summary of history of auroral research from FRITZ (1873) to date is developed by systematically reviewing attempts at explaining the polar incidence of the aurora, the source and nature of the particles, the passage of particles from sun to earth, their penetration into the earth's atmosphere, STÖRMER's and DAUVILLIER's one-sign theory, the ultraviolet light theory of HULBURT (1928), ALFVÉN's (1939) theory, and the CHAPMAN-FERRARO theory of magnetic storms (1931–1940), with comments by the author and criticisms of each theory by other authors. *Subject Headings:* **1. Auroral theories 2. History of auroral research 3. Polar incidence of aurora 4. Auroral particles 5. Magnetic storms.**—*M.R.*

5C–126 551.593.55:551.594.51:535.33

Elvey, C. T., **Emission spectrum of the upper atmosphere at twilight.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 16–21, 4 figs., 6 refs.) **DWB**—A review and analysis of data obtained at McDonald Observatory in 1942 by ELVEY and FARNSWORTH (*see* 5C–116). Conclusions are: 1) 6300 Å auroral (red) line is enhanced by twilight for several hours before sunrise and after sunset, when the sun rays reach >1300 km above the surface; 2) residual intensity of this line decreases rapidly for 1.5 hours after sunset and then gradually through the night; 3) 5577 Å (green) auroral line has no twilight enhancement and remains almost constant through the night; 4) 5892 Å (yellow) line has sudden twilight enhancement, indicating Na+ atoms from 60–120 km; 5) 6560 Å line has similar enhancement to Na+ line; 6) negative 3914 Å line behaves similarly to red auroral line. Graphs show decrease in intensity with time and height. (*Same item as* 3.9–229, Sept. 1952, *MAB*). *Subject Headings:* **1. Sunlit auroral spectra 2. Auroral spectra. I. Farnsworth, A. H. II. McDonald Observatory.**—*M.R.*

5C–127 551.594.51:535.33

Kaplan, Joseph, **The laboratory production of auroral afterglows.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 118–120. ref., 2 eqs.) **DWB**—Productions of auroral afterglows in the laboratory at pressures from 50 mm down to lowest pressure at which a discharge is possible, lead author to surmise that aurora consists of two phases, first a polar aurora and then a few seconds later a nonpolar glow, each yielding different spectra. The first part of the afterglow in pure nitrogen strongly resembles the spectrum of the polar aurora. The middle part is strong in intensity of atomic nitrogen line, and the last part almost entirely of atomic nitrogen (3467 Å) and Vegard-Kaplan bands. Results when oxygen is added are remarkable—a marked increase in green auroral line occurs but N_2O bands are relatively weak. *Subject Headings:* **1. Auroral afterglows 2. Auroral spectra 3. Experimental auroral spectra 4. Vegard-Kaplan bands.**—*M.R.*

5C–128 551.521.4:551.510.535:550.38

Nicolet, Marcel, **Deductions regarding the state of the high atmosphere.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 36–48. 4 tables, 5 refs., 35 eqs.) **DWB**—Author states that he believes that: 1) the normal production of the night-sky light is by recombination, with selective emission; 2) non-uniformity of emission is related to ionospheric structure, meteors, etc. which vary in space and time; 3) night sky light intensity correlates with magnetic activity; 4) atmospheric equilibrium is destroyed during ionospheric and magnetic storms and auroral emission; the spectral distribution becomes more uniform as the direct effect of the corpuscles increases. Detailed treatment of identifications of spectra; photodissociation and photo-ionization; molecular recombination, ionic recombination, collisions between negative ions and neutral atoms, and application to forbidden transitions. *Sub-*

ject Headings: **1. Night airglow 2. Auroral emissions 3. Ionospheric structure 4. Ionization phenomena.**—*M.R.*

5C–129 551.594.51:535.33

*Nicolet, Marcel, **Nouveaux aspects du problème de l'interprétation des radiations de l'aurore.** [New aspects of the problem of interpretation of the auroral radiations.] (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 105–117. 11 tables, 13 refs.) **DWB**—Elaborate tabulation of observations of wavelengths and identifications thereof for various systems and bands of auroral spectra are presented and discussed. Comparison is made between synthetic, experimental and observed systems. Differences are explained tentatively. Conclusion is that neither O_2^+, CN nor atomic radiations are needed to explain certain aspects of the auroral spectra. *Subject Headings:* **1. Auroral emissions 2. Auroral spectra.**—*M.R.*

5C–130 551.510.535:551.594.51:551.521.4

Vegard, Lars, **Report on recent work on ionospheric phenomena and on solar and terrestrial relationship.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** publ. 1948. p. 82–91. 3 refs.). **DWB**—A summary of many separate investigations reported in papers published by the author since 1940 in *Geofysiske Publikasjoner*. The problems discussed are: 1) detection and interpretation of new lines in auroral spectrum; 2) wave length and relative intensity of the weak component of the red O(I) doublet; 3) variability of intensity distribution within the auroral spectrum; 4) determination of ionospheric temperature from auroras at different altitudes and in sunlight; 5) origin and excitation of sodium line in twilight; 6) coronal phenomena and their relation to solar and terrestrial processes; 7) probability of an O atom losing its excitation energy through collisions. It is suggested that the sodium enters the atmosphere from the sun. (*Same item as* 3.9–89, Sept. 1952, *MAB.*) *Subject Headings:* **1. Auroral physics research 2. Night airglow 3. Auroral spectra 4. Temperature of the ionosphere 5. Coronal phenomena 6. Earth's corona. I. Kvifte, G. II. Tønsberg, E.**—*M.R.*

1948

5C–131 551.521.4:551.594.5

†Dufay, Jean, **Recherches sur les phénomènes optiques de la haute atmosphère effectuées depuis 1940 à l'bservatoire de Lyon et à l'Observatorire de Haute-Provence.** [Research on the optical phenomena of the upper atmosphere since 1940 at the Observatory of Lyons and the Observatory of Haute-Provence.] *International Council of Scientific Unions, Brussels. Sixth Report of the Commission for the Study of Solar and Terrestrial Relationships,* [**1948**]. p. 144–156. 74 refs. **MH-BH**—Summarizes briefly works on: brilliance and color of the night sky, its polarization and the special composition of its light; intensity of rays of oxygen and sodium (5577, 6300 and 5892 Å) aurora; twilight phenomena; also laboratory research and theory. (*Same item as* 2.7–99, July 1951, *MAB.*) *Subject Headings:* **1. Night airglow 2. Auroras 3. Twilight 4. France.**—*C.E.P.B.*

5C–132 551.594.51:550.38

Malmfors, Karl Gustav, **Experiments on the aurorae.** *Arkiv för Matematik, Astronomi och Fysik, Stockholm,* 34, Pt. B(1), **1948.** 8 p. 6 figs., refs., 7 eqs. **DLC**—A study using a model of the motion of charged particles in a magnetic dipole field under the influence of a homogeneous electric field. Apparatus described, experimental results given and bearing on ALFVÉN's theory discussed. *Subject Headings:* **1. Experimental auroras 2. Alfvén's theory.**—*M.L.R.*

5C–133 551.594.5

Malmfors, Karl Gustav, **Experiments on the aurorae.** *International Council of Scientific Unions, Brussels. Sixth Report of the Commission for the Study of Solar and Terrestrial Relationships* [**1948**]. p. 108–110. fig. **MH-BH**—A model was constructed (magnetized steel sphere inside evacuated chamber). At pressure of 10^{-3}–10^{-4} mm Hg and a voltage of 1000 V. two illuminated rings appeared. Bearing on theory discussed. (*Same item as* 2.7–194, July 1951, *MAB.*) *Subject Heading:* **1. Experimental auroras.**—*C.E.P.B.*

5C–134 551.594.5:551.510.53

Petrie, William, **Remarks on the excitation of hydrogen and helium in the upper atmosphere.** *Canadian Journal of Research, Ser. A,* 26(6):359–365, Nov. **1948.** fig., table, 15 refs. **DWB**—A number of hydrogen and helium lines have been identified as features of the auroral spectrum. The relative intensities of the helium lines indicates an excitation temperature of 4,600°K and the intensities of the hydrogen lines an excitation temperature of 7,600°K. (*Same item as* 7–133, July 1950, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Upper atmosphere temperature.**—*Author's abstract.*

5C–135 551.510.535:551.594.51

Vegard, Lars, **Report on recent investigations dealing with solar and terrestrial relationships.** *International Council of Scientific Unions, Brussels. Sixth Report of the Commission for the Study of Solar and Terrestrial Relationships,* [1948]. p. 186–190. **MH-BH**—Short summary of papers by author on spectral analysis of aurora. (*Same item as* 2.9–69, Sept. 1951, *MAB.*) *Subject Headings:* **1. Ionospheric layers 2. Auroral spectra.**—*C.E.P.B.*

1949

5C–136 551.594.51

†Bates, David R., **The intensity distribution in the nitrogen band systems emitted from the earth's upper atmosphere.** *Royal Society of London, Proceedings, Ser. A,* 196(1045):217–250, March 22, **1949.** fig., 37 tables, numerous refs., eqs. **DWB**—A fundamental paper on subject indicated in title, comparing the author's theoretical results with observations from low-latitude and high-latitude auroras and sunlit auroras and the twilight sky. Author states that if, as is commonly supposed, the emission is due to electron excitation, temperatures of many thousand degrees absolute must be assumed; but if excitation is due to heavy particles in incident auroral stream, vibrational temperatures much lower could be allowed. Negative as well as second and first positive systems discussed in detail. (*Same item as* 2–179, Feb. 1950, *MAB.*) *Subject Heading:* **1. Auroral nitrogen bands.**—*M.R.*

5C–137 551.594.5:550.38

Fanselau, Gerhard, **Die erdmagnetische Aktivität im Jahre 1947 nach den Beobachtungen in Niemegk.** [Terrestrial magnetic activity in the year 1947 from observations at Niemegk.] *Zeitschrift für Meteorologie,* 3(1/2):19–25, Jan./Feb. **1949.** graph, 14 tables, ref. **DLC**—Daily and 3-hourly character figures and summary of auroral observations given. Figure shows 3-hourly values in 27-day sections. (*Same item as* 5–117, May 1950, *MAB.*) *Subject Headings:* **1. Auroral magnetic relationships 2. Niemegk, Germany.**—*C.E.P.B.*

5C–138 551.510.535:523.74:550.385

Fanselau, Gerhard, **Über die Störung der Ionosphäre vom 24–26 Januar 1949.** [On the disturbance of the ionosphere from January 24–26, 1949.] *Zeilschrift für Meteorologie,* 3(4):100–110, April **1949.** 6 figs., 5 tables. **DWB**—On Jan. 21st two large spots approached central meridian of sun. A magnetic storm began on Jan. 24th and is described in detail. Reception of the 1,250 m space radio wave from Kalundborg showed great variations. Twenty-seven-day recurrences are clearly shown in Potsdam magnetic character figures from Dec. to March. Associated auroras on Jan. 24–26 are listed and described. (*Same item as* 5–116, May 1950, *MAB.*) *Subject Headings:* **1. Auroral magnetic relationships 2. Auroral solar relationships 3. Ionosphere 4. Potsdam, Germany.**—*C.E.P.B.*

5C–139 551.508.94

Petrie, William, **A new high light gathering power spectrograph for auroral studies.** *Canadian Journal of Research, Sec. A,* 27(6):231–233, **1949.** 3 figs., table, refs. **DLC**—The optics of the spectrograph consist of two 15,000 lines per in. plane grating with ruled surface 4 in. by 4 in. The grating concentrates light in the second order spectrum; the dispersion in this order for normal incidence is 22 Å per mm. A few spectra were obtained during the spring of 1949, and the results appear to be most promising. These spectra include several interesting features, one of which is a strong radiation of wave length 4320 Å in the second order. This radiation is likely to be an intense first order infrared feature. *Subject Headings:* **1. Spectrographs 2. Auroral spectra.**—*Author's abstract.*

1950

5C–140 551.594.5:550.38

†Alfvén, Hannes, **Magnetic storms and aurorae.** (In his: **Cosmical electrodynamics.** Oxford, Clarendon Press, **1950.** Chap. VI. p. 175–207. 20 figs., 26 refs., 27 eqs. **DLC**—Opens with the statement that "The intimate connection between magnetic storms and aurorae makes it necessary to consider them as two manifestations of the same phenomena." Reviews the work of Birkeland and Störmer which he considers the first serious attempt to interpret magnetic storms and auroras. He next summarizes the investigations of Chapman and Ferraro. A more detailed discussion of the electric field theory (Alfvén) and Malmfor's scale-model experiment follows. *Subject Headings:* **1. Auroral magnetic relationships 2. Auroral theories 3. Alfvén's theory.**—*M.L.R.*

5C–141 551.594.5:523.74

Bakharev, A. M., **Grandioznoe poliarnoe siianie.** [A magnificient polar aurora.] *Priroda,* 39(2):30, Feb. **1950. DLC**—A spectacular aurora was observed on Jan. 24–26, 1949 at Murmansk-

Poliarnyĭ, Kaliningrad and Taptu. The article contains KHLIUSTIN's description of observation made at Murmansk. According to calculation made by the author, the aurora was caused by a very active group of sunspots which originated on the invisible side of the solar disc on Jan. 10–13 and which passed the central meridian on Jan. 24. The group was noticed on Jan. 20 and could be observed by the naked eye up to Jan. 25th. *Subject Headings:* **1. Auroral solar relationships 2. U.S.S.R.**—*A.M.P.*

5C–142 551.594.51

Barbier, D. and Williams, D. R., **Observations of the aurora borealis.** *Journal of Geophysical Research*, 55(4):401–414, Dec. **1950.** 5 figs., table, 15 refs., eq. **MH-BH**—Spectrographic and photoelectric-photometric observations of the aurora borealis were made at Fairbanks, Alaska. The proposed identifications of lines and bands in the spectral range from 3100 Å to 5000 Å are presented in a table. The intensities of the second pontine N_2 group correlate well with laboratory observations and with the measurements of VEGARD. The intensities of the negative N_2^+ spectrum differ from those observed in the laboratory and also from those of VEGARD. Night sky O_2 Herzberg bands and night sky Y bands are present in the auroral spectra. There is no correlation between the observed intensity distribution in the Vegard-Kaplan system in the aurora and that in the night sky. The characteristics and significance of the various other bands and lines observed are discussed. The presence of NI 3467 and OI 4368 is confirmed. Several observations in the visible between 6400 to 6900 Å are discussed and visual observations of auroral phenomena including a blue, sunlit aurora are presented. (*Same item as* 2.5–201, May 1951, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Sunlit auroral spectra 3. Upper atmosphere 4. Fairbanks, Alaska.**—*I.L.D.*

5C–143 551.594.5:551.590.21

Chapman, Sydney, **Corpuscular influences upon the upper atmosphere.** *Journal of Geophysical Research*, 55(4):361–372, Dec. **1950.** 15 refs. **MH-BH**—A critical review of the evidence for the solar corpuscular theory of the origin of auroras and of magnetic and ionospheric disturbances of varying intensities. Indirect evidence is based upon observations on the directive property and lateral limitation of solar flare influence and upon the supposed speed of corpuscles and time of the storms. The direct evidence for corpuscular emissions from the sun and for corpuscular ionospheric solar eclipses, the course of the charged corpuscles near the earth under the influence of magnetic and auroral activity and geomagnetic effects are discussed. The strongest present direct evidence for the solar corpuscular theory is provided by the hydrogen lines in the auroral spectrum; their broadening and displacement is attributed to the Doppler effect. (*Same item as* 2.7–192, July 1951, *MAB.*) *Subject Headings:* **1. Auroral solar relationships 2. Corpuscular theory 3. Ionospheric disturbances.**—*I.L.D.*

5C–144 551.594.5:523.74

Chistiakov, V. F., **Poliarnoe siianie 25 ianvaria 1949 g. v Kaliningrade.** [An aurora observed on January 25, 1949 at Kaliningrad.] *Priroda*, 39(2):30, Feb. **1950. DLC**—Detailed description of the different phases of an aurora. Author connects the display with the appearance a large group of sunspots which passed through the central meridian between Jan. 23–25. (*Same item as* 10–184, Oct. 1950, *MAB.*) *Subject Headings:* **1. Auroral solar relationships 2. Kaliningrad, U.S.S.R.**—*A.M.P.*

5C–145 551.594.5 551.508.94

Currie, B. W., **Report on auroral investigations at the University of Saskatchewan, Canada.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:471–472, **1950.** Appended: **Auroral studies at the University of Saskatchewan,** by William Petrie, p. 473. **DWB**—Auroral studies were interrupted at the University of Saskatchewan from 1941–6. Since 1946 two lines of work have been pursued: 1) the development of a recording meter for overhead aurora and 2) investigation of auroral spectra. The recorder can be run from sunset to sunrise and during moonlight, and gives exact times of occurrence of overhead auroras. Some interference is experienced during moonlight and twilight. Saskatoon spectra are compared with those obtained during 1932–33 Polar Year at Chesterfield with the same instrument. *Subject Headings:* **1. Auroral spectra 2. Auroral recorders 3. Saskatoon, Saskatchewan 4. Chesterfield, Canada. I. Petrie, William.**—*M.R.*

5C–146 551.510.535:551.594.5

Eyfrig, R., **La perturbation ionosphérique causée par l'aurore boréale du 20–21 février 1950.** [Ionospheric perturbation caused by the aurora borealis of February 20–21, 1950.] *Annales de Géophysique*, 6(1):70–73, Jan.–March **1950.** 2 figs. **MH-BH**—The author discusses ionospheric disturbances produced at latitude 48°N by an aurora borealis. From an analysis of two echoes it was concluded that the concentration of electrons in the E layer was $3 \times 10^4/cm^3$ and the height of

his layer was 140 km. The concentration of electrons in the F_2 layer was very high. (*Same item* s 2.2–55, Feb. 1951, *MAB.*) *Subject Headings:* **1. Ionospheric disturbances 2. Ionospheric waves 3. Ionospheric perturbations 4. Auroral effects on ionosphere.**—*I.L.D.*

5C–147 551.594.51:546.11

Gartlein, Carl W., **Aurora spectra showing broad hydrogen lines.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin,* No. 13:491–492, **1950.** Discussion by Nicolet and Vegard. Also in: *American Geophysical Union, Transactions,* 31(1):18–20, Feb. **1950. DWB**—By means of a spectrograph installed in 1939 at Cornell University, the author discovered broad hydrogen line at 4861 Å. It was assumed that this could not be atomic hydrogen. Later plates (obtained in 1941 and 1946) showed that the lines were due to Hα (6563 Å), Hβ (4861 Å) and Hγ (4340 Å) and that the latter two are always broad. These lines must be due to hydrogen in violent random motion, with velocities 200–500 km/sec when the protons enter the atmosphere. These lines have appeared 44 nights since 1943, and on 14 of these nights the H appeared before and during sudden auroral outbursts, suggesting that the hydrogen may initiate the outburst. Quiet auroras do not show H spectra. Sudden outbursts double intensity of aurora light recorded photoelectrically (since 1941). (*Same item as* 5–118, May 1950, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Auroral intensities 3. Auroral hydrogen lines. I. Vegard, Lars II. Nicolet, Marcel.**—*M.R.*

5C–148 551.521.4 551.594.51

Ghosh, S. N., **Excitation processes of night sky and auroral spectra.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept.* **1950,** *Proceedings,* p. 227–230. Pub. 1951. **DWB**—Results of investigations lend strong support to the hypothesis that mutual neutralization of N_2^+ and O^- excites the observed N_2 bands and O lines of the night sky spectrum. The spectral features of the aurora that are common with night sky spectrum can be explained by the hypothesis. *Subject Headings:* **1. Night airglow spectrum 2. Auroral spectra.** —*From author's conclusion.*

5C–149 551.594.5 551.510.535

Harang, Leiv, **Report of research on aurorae and earth magnetic storms made at Nordlysobservatoriet, Tromsö, during the years 1939–1946.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin,* No. 13:186–187, **1950.** 7 refs. **DWB**—A statistical study of the heights of 355 auroral arcs and 293 draperies was made, showing that there is a gradual decrease of the heights of the lower border as the intensity of the aurora increases. The diurnal variation in the direction of the arcs was also illustrated. The luminosity curve of the aurora was studied to determine the absorption of the possible rays entering the atmosphere and the scale-height of the atmosphere (H = KT/mg) from 100 to 200 km height. Ionospheric and magnetic storm studies were also made during the war years. *Subject Headings:* **1. Auroral research 2. Ionospheric research Norway.**—*M.R.*

5C–150 551.594.51

Kaplan, Joseph, **Laboratory studies related to the physics of the upper atmosphere.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin,* No. 13:474–479, **1950.** refs., 3 eqs. **DWB**—A detailed summary of results of laboratory experiments on the spectrum of the auroral afterglow. It is recognized that the laboratory conditions are not identical with those of the upper atmosphere, but a great deal is learned about the strong and weak afterglows of nitrogen and the newly discovered afterglow of oxygen which resembles actual auroral afterglows. The origin of the observed bands as well as their analogy to natural auroral spectra is hypothesized. The N_2^+ bands are considered the most significant. *Subject Headings:* **1. Auroral afterglows 2. Auroral physics 3. Auroral nitrogen bands 4. Experimental auroral spectra.**—*M.R.*

5C–151 551.594.51

Malmfors, K. G., **Model experiment on the aurora.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin,* No. 13:470–471, **1950. DWB**—To verify ALFVÉN's (1939–40) theory (*see* 5C–104) that the aurora is a manifestation of an electric field of charged particles from the sun moving in a magnetic field, a laboratory model was set up consisting of a magnetized sphere in a homogeneous electric field in a vacuum chamber (pressure 10^{-4} mm). When voltage of several thousand volts was applied between two parallel metal plates (25 cm apart), a luminous ring was formed around each pole (but slightly eccentric) about 45° from the pole. Not much equatorward displacement was noted when voltage was increased from 500 to 8000 V. *Subject Headings:* **1. Auroral theories 2. Experimental auroras 3. Alfvén's theory.**—*M.R.*

5C–152 551.594.51:550.38

Martyn, D. F., **Magnetic storms and aurorae. Solar particles at the earth.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept.* **1950** *Proceedings*, p. 49–58, publ. 1951. 8 figs. **DWB**—The Chapman-Ferraro hypothesis is used to explain the commencement of a magnetic storm, and auroras or ionospheric variations produced by solar particles. The author differs, however, with the above theory in the explanation of the completion of the current ring around the earth. The idea of a streamlined flow around the earth exerting no pressure on the sphere is said to be the only steady state possible. Chapman-Ferraro equations for stability of the current once formed are developed to explain several geomagnetic phenomena. More yet remains to be explained. *Subject Headings:* **1. Auroral theories 2. Chapman-Ferraro theory 3. Magnetic storms.**—*M.R.*

5C–153 551.594.5

Meinel, A. B., **Evidence for the entry into the upper atmosphere of high-speed protons during auroral activity.** *Science*, 112(2916):590, Nov. 17, **1950.** 2 refs. **MH-BH**—During several nights of intense auroral activity a special spectrograph designed by the author was pointed towards the magnetic lines of force. The profile of the H-alpha emission line was found to be asymetrical with a maximum violet displacement of 60 A, corresponding to a velocity of 2800 km/sec. Viewed perpendicularly to the magnetic lines, the H-alpha line is symmetrical and undisplaced but broadened by about 6 A. The red edge of the asymmetrical H-alpha had a profile broadened about 6 A. The Doppler displacements indicate that protons of solar origin enter the upper atmosphere at velocities of the order of 2500–3000 km/sec. (*Same item as* 2.9–178, Sept. 1951, *MAB.*) *Subject Headings:* **1. Solar proton theory 2. Stratosphere 3. Auroras.**—*I.L.D.*

5C–154 551.594.5

Meinel, A. B., **Strong permitted O (I) and N (I) lines in the infrared auroral spectrum.** *American Geophysical Union, Transactions*, 31(1):21–24, Feb. **1950.** 3 figs., 10 refs. **MH-BH, DWB**—Results of observations on the infrared radiations in upper atmosphere made at Lick Observatory. Equipment is described. Energy level diagrams for strong permitted lines of oxygen and nitrogen in aurora, and variation of excitation with energy level for seven permitted transitions are shown graphically. There is conclusive evidence that telluric bands in night sky spectra occur in *absorption* not in *emission* as formerly held. (*Same item as* 5–120, May 1950, *MAB.*) *Subject Headings:* **1. Infrared radiation 2. Auroral spectra 3. Night airglow.**—*M.R.*

5C–155 551.594.5:550.38

Moiseev, A. P., Astapovich, I. S. and Savich, V. P. (ed.), **Zamechatel'noe poliarnoe siianie 20 fevralia 1950 g.** [Remarkable aurora borealis on February 20, 1950.] *Priroda*, Moscow, 39(11):48–49, Nov. **1950.** 4 refs. **DLC**—Report on a brilliant and colored aurora observed in Moscow and other places on Feb. 20, 1950. According to additional reports received by the editor, the phenomenon was observed in different points of European and Asiatic Russia as well as in western Europe and the U.S.A. One observer reported seeing red rays reflected from snow. Communications were interrupted over many parts of Eurasia and the North Atlantic (see MIDDLETON, *Sky and Telescope*, No. 6, 139, 1950; also *L'Astronomie*, 64:123, 1950). The magnetic storm corresponded with a very large group of spots located on the central meridian of the sun Feb. 20, 1950. (*Same item as* 2.5–203, May 1951, *MAB.*) *Subject Headings:* **1. Auroras 2. Magnetic storms 3. Solar-magnetic relationships 4. U.S.S.R.**—*M.R.*

5C–156 551.510.535:551.594.5:550.3

Nagata, T., Fukushima, N. and Sugiura, M., **Geomagnetic variations and ionospheric current systems.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept.* **1950,** *Proceedings*, p. 154–156. publ. 1951. **DWB**—Supporting evidence for dynamo theory of ionosphere is given from theoretical study of the mechanism of the daily disturbance variation S_D, assuming a high conductivity of the auroral zones. The bay-field can also be interpreted in the same way, when the duration of the induced E.M.F. in the auroral zones is limited to a few hours. *Subject Headings:* **1. Ionospheric currents 2. Auroral zone conductivity 3. Dynamo theory of ionosphere.**—*M.R.*

5C–157 551.594.5

*Nicolet, Marcel and Dogniaux, R., **Nouvelles suggestions au sujet de l'interprétations du spectre des aurores.** [New suggestions on the subject of interpretation of the spectrum of auroras] *Journal of Geophysical Research*, 55(1):21–32, March **1950.** 12 figs., 5 tables, 3 refs. Abstract English p. 21. For English summary see: *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:465–466, **1950.** **DWB**—A great deal of painstaking data on intensity and width of spectral bands of auroral radiations are presented in tables and analyzed

show evidence of N_2^+ bands as distorted by temperature effect, O_2^+ bands and possibly NO and other emission bands. Data from synthetic auroral spectra are compared with actual data obtained by VEGARD. (*Same item as* 7–132, July 1950, *MAB.*) *Subject Heading:* **1. Auroral spectra.**—*M.R.*

5C–158 551.594.51:551.521.61

Petrie, W., **The near-infrared spectrum of the polar aurora.** *Journal of Geophysical Research*, 55(2):143–151, June **1950.** fig., 4 tables, 10 refs., 2 eqs. **MH-BH**—Four auroral spectra, obtained with a grating spectrograph at Saskatoon, Saskatchewan, are analyzed and one of them illustrated. Evidence exists that He(I) atoms are excited to 24 electron-volts, and other lines (N(I) and O(I) and several N_2 bands are present at lower energy levels. Intensity of O(I) lines indicates excitation temperature of 7,000°K, with evidence of large proportion of N_2 molecules having dissociated at height of 60 mi. (*Same item as* 8–145, Aug. 1950, *MAB.*) *Subject Headings:* **1. Infrared radiation 2. Auroral spectra.**—*M.R.*

5C–159 551.594.51

Petrie, William, **Remarks on the excitation of hydrogen and helium in the upper atmosphere.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:466–470, **1950.** fig., table, 10 refs. **DWB**—The author cites evidence to prove that electron collisions are the source of excitation of H and He in the atmosphere. Excitation temperatures are worked out for H and He in the auroral zone and a temperature of 4600°K indicated. VEGARD found that N_2 temperatures were only 300°K, showing that the auroral zone is not in a state of thermal equilibrium. It is thought that the H and He come from the sun and are not permanent constituents of the upper atmosphere, since the lines of the 1st two members of the Balmer series are only rarely encountered in the auroral spectra. *Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines 3. Balmer lines 4. Auroral zone temperatures.**—*M.R.*

5C–160 551.510.53:551.594.13

*Petrie, William, **Remarks on the passage of positive ions through the upper atmosphere.** Saskatchewan. University. Physics Dept., Contract AF 19(122)-152, Scientific Report No. AR-1, [1950?] 33 p. 25 tables, 17 refs. **DWB**—Calculation of the energies of electrons, protons, He^+ ions and Ca^+ ions passing through the upper atmosphere, based on speeds of 800 and 1600 km/sec respectively (corresponding to range of possible speed of particles which produce the aurora, estimated from time of travel from sun to earth during magnetic storms or solar flares) makes it apparent that the particles cannot be electrons unless the electrons pick up energy in passing through the atmosphere. Hence, it is concluded that the particles must be positive ions. Various considerations of alternative possibilities are discussed quantitatively. Extensive tables are given for a temperature of 4000°K for He, Mg, Si, Ca, Na, K, A, K^+, S spectra. *Subject Headings:* **1. Upper atmosphere 2. Auroral spectra 3. Solar emanations 4. Ion mobility. I. Saskatchewan. University. Physics Dept. II. Contract AF 19(122)-152.**—*M.R.*

5C–161 551.594.51:535.33

Petrie, William and Small, R., **The relative intensities of nitrogen bands in the auroral spectrum.** Saskatchewan. University. Physics Dept. Contract AF19(122)-152, Scientific Report No. AR-2, Dec. **1950.** 8 p. fig., 3 tables, 7 refs. **DWB**—From 3 spectra obtained at Saskatoon during Feb. and March 1950, the relative intensities of the first negative group and second positive group of nitrogen bands were determined. Conclusion is that intensities of N_2^+ bands decrease more rapidly with increasing vibrational quantum number of the upper electronic state than did the values obtained by BARBIER. The vibrational intensities of 1800° and 8300°K indicate that excitation is caused by high energy particles. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands 3. Saskatoon, Saskatchewan. I. Univ. Physics Dept. II. Contract AF19(122)-152.**—*M.R.*

5C–162 551.594.5

Robley, R., Bricard, J. and Kastler, A., **Le spectre de l'aurore boréale du 25 au 26 janvier 1949.** [The auroral spectra of Jan. 25 to 26, 1949.] *Annales de Géophysique*, 6(1):66–67, Jan./March, **1950.** 2 figs., table, 3 refs. **MH-BH**—The author describes a very intense aurora observed at the Swedish observatory of Abisko. A curve of dispersion was constructed: from 6500 Å to 4500 Å with neon radiation, and from 4500 Å to 3500 Å with the best known auroral radiation. A table in which the measured radiations are compared with values obtained by VEGARD is presented. Also, the infrared spectrum of the aurora has been examined. (*Same item as* 2.3–172, March 1951, *MAB.*) *Subject Heading:* **1. Auroral spectra.**—*I.L.D.*

5C–163 551.594.51:551.521.61

*Rodionov, S. F. and Fishkova, L. M., **Ob infrakrasnom izluchenii poliarnykh siianii.** [On the infrared radiation of aurora borealis.] *Akademiia Nauk SSSR, Doklady*, 70(6):1001–1003, **1950.**

2 tables, 6 refs. **DLC**—A photometric investigation of the infrared part of the auroral spectrum was carried out during March 1949 at a northern latitude station. Its main purpose was to prove the existence of radiation in the region of 1.02–1.04μ. The intensity of infrared and green radiation was measured in numerous auroras and it was found that the radiation in 0.9–1.08μ is 20–30 times higher than that of the green line. The method of investigation is described and data obtained are given in tables. *Subject Headings:* **1. Auroral spectra 2. Photometry 3. Infrared radiation 4. U.S.S.R.**—*N.A.S.*

5C–164 551.5:016

†Royal Meteorological Society, London, **Bibliography of meteorological literature . . .** London, Royal Meteorological Society, [1922]–1950. 6 v. (holdings inc.) **DWB, DLC**—This unannotated bibliography is a continuation of the Bibliography of Meteorology received in the libraries of the Royal Meteorological Society and the Meteorological Office of Great Britain which was published in the *Quarterly Journal* of the Society from Jan. 1917 to Oct. 1920. The first No. of this separate issue covers the period from Sept. 1920 to June 1921; the final No. covers the period from July to Dec. 1948. A modification of the arrangement used in the International Catalogue of Scientific Literature is followed. The references are arranged alphabetically by author under the larger divisions of meteorology. Material on aurora is listed under the section on Atmospheric Electricity. *Subject Headings:* **1. Meteorological bibliographies 2. Auroral bibliographies.**—*M.L.R.*

5C–165 551.594.51:551.521.61

Small, R. and Petrie, William, **Charts of useful infrared comparison spectra.** Saskatchewan. University. Physics Dept. Contract AF19(122)-152, Scientific Report No. AR-3, Dec. **1950.** 2 p. photos., ref. **DWB**—Charts are presented for photographic infrared spectra of argon, krypton, neon and zenon (second order) and for mercury, and helium (first order), for use in night sky and auroral spectroscopy. The wave lengths are according to the MIT wave-length tables and the tables in the Handbook of Chemistry and Physics. *Subject Headings:* **1. Auroral spectra 2. Infrared spectroscopy 3. Constants. I. Saskatchewan Univ. Physics Dept. II. Contract AF19(122)-152.**—*M.R.*

5C–166 551.594.5:551.510.535

Stranz, Dietrich, **Eng begrenzte Ionisationswolken in 125 km Höhe während einer Nordlichtstörung.** [Sharply defined ionization clouds at 125 km during an auroral disturbance (Sporadic E-echoes).] *Archiv der Elektrischen Übertragung*, 4:213–216, **1950.** 3 figs., table, ref. **DBS, DLC**—Describes and illustrates sporadic E layer formation and disappearance on Sept. 15 and 16, 1948 from 22h to 01h as recorded by 3MHz echo equipment at Göteborg. This layer was sharply defined at 125 km height and showed many resemblances to the formation and movement of auroral rays. Magnetic, solar corpuscular and ionospheric data and observations are reconciled with theory. *Subject Headings:* **1. Aurora and sporadic E-layer 2. Sporadic E layer (Es) 3. Auroral ionization of E layer 4. Auroral effects on ionosphere.**—*M.R.*

5C–167 551.594.5:621.396

Tilton, Edward P., **Long-distance communication over north-south paths on 50 Mc/s.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept.* **1950,** *Proceedings*, p. 119–120. publ. 1951. ref. **DWB**—During sunspot cycle peak of 1947–48, radio amateurs made discoveries regarding 50–54 Mc/s communication from Europe to South Africa and from North America to South America. Daily records made in Feb., March, Oct. and Nov. 1949 and Feb.–March 1950, showed that no communication was possible between U.S.A. north of 40°N and South America except on the day following a visible aurora or ionospheric disturbance. *Subject Headings:* **1. Amateur radio communication 2. Inter-hemispheric communication 3. Auroral effects on radio propagation.**—*M.R.*

5C–168 551.594.51:551.510.535

Vegard, Lars, **New important factors in relation to the composition and state of the ionosphere derived from auroral studies.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd meeting, Brussels, Sept.* **1950,** *Proceedings*, p. 79–81. publ. 1951. table, eq. **DWB**—Using a new spectrograph constructed according to author's specifications by the Société Générale d'Optique in Paris, a spectrogram of a brilliant auroral display was observed at Oslo on the night of Feb. 23–24, 1950. Table gives number of lines originating from neutral and singly ionized N- and O-atoms. An ionospheric temperature determination of −54°C was in good agreement with previous determinations. *Subject Headings:* **1. Auroral spectra 2. Temperature of the ionosphere.**—*M.L.R.*

5C–169 551.594.5:551.510.53

Vegard, Lars, **Nouveaux résultats importants dans l'étude de spectre des aurores boréales et la physique de l'ionosphère.** [New important results in the study of the spectrum of the aurora

borealis and physics of the ionosphere.] *Annales de Géophysique*, 6(3):157–163, July–Sept. **1950.** fig., 2 tables, 4 refs. French and English summaries p. 157. **MH-BH**—A new spectrograph with two prisms and with an opening F/1.2 was used to study an aurora that appeared Feb. 23–24, 1950. Fifty-four new atomic lines in the region 3900–6300 Å were observed. The presence of molecular O_2 was demonstrated. A large number of lines were shown to be produced by nitrogen and oxygen atoms in the neutral and ionized state. The rotational components of the R-branch of the band 3914 appeared separated so that a more accurate determination of the auroral temperature, namely, −54°C, could be made. (*Same item as* 3.11–277, Nov. 1952, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Ionosphere.**—*From author's abstract.*

5C–170 551.594.5:551.510.53

Vegard, L., **Properties of the upper atmosphere revealed through spectral analyses of aurorae and twilight.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:479–490, **1950.** 18 refs., 4 eqs. See also report by H. Alfvén, p. 188–195. **DWB**—A clear exposition of the steps by which a logical hypotheses for the composition, structure, height and other characteristics of the upper atmosphere has been developed. The two most important methods of study are: a) spectral analysis of the night airglow and aurora and b) radio wave propagation studies. Rocket exploration is mentioned as an important innovation. Auroral spectra of N_2 ions at high altitudes show that the barometric height formula, formerly assumed to hold for distribution of gases in the stratosphere, breaks down in the auroral region, since it would show a zero concentration of N_2 at 130 km. Theory of high atmosphere structure gives a good idea of the development and structure of the sun's corona. The author discusses the lines from atomic oxygen in various states of ionization, lines from atomic nitrogen, occasional hydrogen lines which sometimes show Doppler displacement, sodium lines, ozone concentration, formation of luminous night clouds (by combination of Na and H ions with free oxygen atoms to form water vapor and sodium oxide); determination of ionospheric temperatures from normal or sunlit auroras, geographical changes in auroral spectra indicating that matter at great altitudes accumulates towards the plane of the magnetic equator, thus giving some indication of the cause of the zodiacal light and the geographical distribution of ion density in the F2 layer. ALFVÉN, in the discussion which follows the article, protests against VEGARD basing his theory on charged particles from the sun hitting the earth's atmosphere, but thinks the explanation is more likely to be the creation of an electric field by a stream of ionized gas polarized by the sun's magnetic field in the vicinity of the earth. *Subject Headings:* **1. Upper atmosphere structure 2. Auroral theories 3. Auroral spectroscopy. I. Alfvén, Hannes.**—*M.R.*

1951

5C–171 551.594.51:551.510.535:537.56(0613)

Aden, A. L., **Auroral physics. International conference held in Canada.** *Physics Today*, N. Y., 4(12):33–37, Dec. **1951. DWB**—Report on the international conference on auroral physics and on properties and physics of the ionosphere and the mesosphere held at London, Ontario, Canada on July 23–26, 1951. The conference was attended by over 120 representatives of 8 countries and was mainly concerned with investigations of the ejection of material from the sun, the transit of these particles to the earth and the resulting ionization phenomena. Abstracts of the papers submitted to the conference are presented. (*Same item as* 3.5–284, May 1952, *MAB.*) *Subject Headings:* **1. Auroral physics 2. Ionospheric physics 3. Ionization 4. Solar physics 5. Conference on Auroral Physics, London, Ontario, July 1951. I. U. S. Air Force. Cambridge Research Center II. London, Ontario. Univ. of Western Ontario.**—*G.T.*

5C–172 551.508.99:551.594.5

Alaska. University. Geophysical Institute, **Experimental investigations of the upper atmosphere during periods of auroral activity.** Contract AF 19(122)-431, Reports, No. 1 and 2, Nov. 1, 1950 to Aug. 1, **1951.** 15 p. **DWB**—A description of the instrumentation employed in the investigation of auroral displays, namely infrared and ultraviolet spectrographs, apparatus and discharge tubes for studies of afterglow; the various projects undertaken are listed and described, and some of the results are discussed. *Subject Headings:* **1. Auroral instruments 2. Upper atmosphere research.**—*I.L.D.*

5C–173 551.590.21:550.38:551.594.5(02)

Chapman, Sydney, **The earth's magnetism.** London, Methuen, **1951.** 2nd ed. rev. and reset. 127 p. 39 figs., 7 refs. **DLC**—A revision of the second edition of a work which first appeared in June 1936. The pocket sized book gives the overall picture of the present knowledge of the earth's magnetic field and its variations. Incidentally, the aurora, earth currents, solar relationships, cosmic rays and ionospheric disturbances in relation to the magnetic field are covered. The major parts are as follows: I. Main field and secular variation; II. Transient variations; III. Quiet-day solar daily variations (Sq); IV. Lunar daily variations (L); V. The morphology of the magnetic

disturbance field D; and VI. Solar relations. Many charts, graphs and diagrams, but little mathematics, are included. (*Same item as* 4.4–263, April 1953, *MAB*). *Subject Headings:* **1. Solar magnetic relationships 2. Auroral solar relationships 3. Textbooks.**—*M.R.*

5C–174 551.594.51 55.038.5

Chapman, Sydney, **Notes on aurorae and magnetic storms. I. Considerations as to a model experiment.** *Journal of Atmospheric and Terrestrial Physics*, 1(3):189–199, **1951.** 13 refs., eqs. **MH-BH**—The Chapman-Ferraro theory that auroras and magnetic storms are produced by projection from the sun towards the earth of a large volume of neutral ionized gas, mainly hydrogen, is discussed and a model experiment to test it is proposed. The basic calculations are set out and some suggestions made, but the actual model has not yet been worked out. (*Same item as* 2.9–179, Sept. 1951, *MAB.*) *Subject Heading:* **1. Auroral magnetic relationships.**—*C.E.P.B.*

5C–175 551.594.51

Dahlstrom, C. E. and Hunter, D. M., **O_2^+ and H in the auroral spectrum.** *Physical Review*, 84(2):378–379, Oct. 15, **1951.** 2 refs. **DLC**—Auroral radiation in the spectral range 3800–7000 Å are attributed to H (H) and O_2^+ (1st neg. system) excitation. It is suggested that the latter, extending from 5200 to 6400 Å, is partially responsible for the colour of type B red aurorae, the red colour being developed at the atmospheric transition level, $O \rightarrow O_2$. *Subject Heading:* **1. Auroral spectra.**—*Physics Abstracts, No. 671, 1952.*

5C–176 551.594.51

Gartlein, Carl Witz, **Protons and the aurora.** *Nature*, London, 167(4242):277, Feb. 17, **1951.** 2 refs. **DWB**—Describes spectrograms obtained at Arnprior (Ont.) and Ithaca (N. Y.) of an auroral arc on Sept. 30, 1950 showing hydrogen line at 6562–6563 Å. (*Same item as* 2.5–205, May 1951, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines.**—*C.E.P.B.*

5C–177 551.594.5:551.521.64

Gerson, N. C., **Correlation of auroras with increased cosmic ray intensities (November 9, 1949).** *Nature*, London, 167(4257):894–895, June 2, **1951.** table, 9 refs. **DWB**—A solar flare of importance 3 was observed 10.29–11.19 G.M.T., associated with considerable (up to 2000%) increases of cosmic ray activity, ionospheric disturbance and many records of aurora, both Northern and Southern Hemispheres. (*Same item as* 2.11–190, Nov. 1951, *MAB.*) *Subject Headings:* **1. Auroral cosmic ray relationships 2. Cosmic radiation 3. Solar flares 4. Northern Hemisphere 5. Southern Hemisphere.**—*C.E.P.B.*

5C–178 551.594.5:771

*Herman, L. and Leinbach, H., **A photographic study of changes of the infrared emission of the polar aurora.** *American Geophysical Union, Transactions*, 32(5):679–682, Oct. **1951.** 4 figs., 2 tables. Also as: Alaska. Univ. Geophysical Institute, Experimental investigation of the upper atmosphere during periods of auroral activity, Contract AF 19(122)-431, Scientific Report No. 3, July 19, **1951.** 4 p. **DWB**—Report on results obtained from about 200 pairs of pictures of auroral light at College, Alaska, during March 1951. The pictures were taken simultaneously on a panchromatic film through green filter and on an infrared film through red filter, using a single tripod. Three double sets of pictures are shown in photographs and relative intensities of infrared and green pictures for two series indicated in tables. The pictures taken are claimed to cover almost all auroral forms and to show noticeable changes in about 5% of the cases. It is expected that this percentage, although apparently sufficient to justify the application of the method, could be further improved by using shorter time exposure. (*Same item as* 3.5–288, May 1952 and 4.1–269, Jan. 1953, *MAB.*) *Subject Headings:* **1. Auroral photography 2. Infrared auroral emissions 3. College, Alaska.**—*G.T.*

5C–179 551.594.5

Kaplan, Joseph; Brook, Marx and Kash, S. W., **Introduction, Part I. Laboratory studies related to the physics of the upper atmosphere, Part II. A study of the decay of nitrogen afterglows, Part III. Measurement of transition probabilities, Part IV.** California. University. Institute of Geophysics, Contract N60nr-27508, Final Report, Feb. **1951.** 46 p. figs., photos, tables, refs., eqs. **DWB**—Pt. I is a report on the discharge and afterglow spectra in pure O_2, in O_2 containing small amounts of N_2, O_2-H_2O mixtures, He-O_2-H_2O mixtures and O_2-H_2O-N_2 mixtures. Ozone was found to play a very important part in the reactions, producing the emissions associated with afterglow. Pt. II is the report of a study on the time decay of spectra appearing in an almost pure nitrogen afterglow as functions of pressure and discharge current. The investigation was carried out by means of photomultiplier and monochromator. The decay of the afterglow was produced by a combination of surface and volume effects. Pt. IV deals with studies on the lifetime

of metastable states falling in the range 10^{-4} to 10^{-2} seconds, especially the metastable rare gas atoms and molecules. (*Same item as* 2.9–176, Sept. 1951, *MAB.*) *Subject Headings:* **1. Experimental auroral spectra 2. Nitrogen spectra 3. Nitrogen afterglow. I. California, Univ. Institute of Geophysics. II. Contract N6onr-27508.**—*I.L.D.*

5C–180 551.594.51:550.385

Martyn, David F., **The theory of magnetic storms and auroras.** *Nature*, London, 167(4238): 92–94, Jan. 20, **1951.** 6 refs., 7 eqs. For comments by H. Alfvén and reply by author, see *ibid.*, 167(4259):984–985, June 16, **1951.** And discussion by S. Chapman, *ibid.*, 168(4263):86, July 14, **1951.** 5 refs. **DLC**—The Chapman and Ferraro theory of ionospheric storms, auroras and equatorial ring-currents is extended along rather new lines involving analogy of motions of particles in the magnetic field of the earth to hydro- and electrodynamic motions. The theory is outlined in considerable detail and its merits in explaining known magnetic and auroral phenomena, and in predicting the behavior of the Hall current (around the auroral zone) and a meridional current across the auroral zone at about 90 km and back to the ring current forming a closed system of sheets. Diurnal effects in ionosphere, including F layer are also explained by this hypothesis. ALFVÉN stresses the need for experiments such as Birkeland's, to check geophysical theories (*same item as* 2.11–192, Nov. 1951, *MAB*). CHAPMAN, referring to above theory, discusses the difficulties of verifying theories, both experimentally and theoretically (*same item as* 2.11–193, Nov. 1951, *MAB*). *Subject Headings:* **1. Auroral theories 2. Auroral zone currents 3. Ionosphere theory. I. Alfvén, Hannes II. Chapman, Sydney.**—*M.R.*

5C–181 551.594.51:535.33

Meinel, Aden B. (*Yerkes Observatory*), **The auroral spectrum from 6200 to 8900 Å.** *Astrophysical Journal* Chicago, 113(3):583–588, May **1951.** 3 figs., table, 6 refs. **DWB**—Spectra obtained at Yerkes Observatory during auroral storm of Aug. 18–19, 1950 are presented, showing bands between 6200 and 8900 Å with an exposure of $1\frac{1}{4}$ hours. It is stated that the infrared region of the auroral spectrum has a number of bands due to molecular and atomic emissions, such as a new system identified as N_2^+, the first positive system of N_2 and the atmospheric system of O_2. Permitted atomic emissions lines for N_I, O_I and H_α were discovered to be present. A table shows details of wave lengths, wave numbers and intensities. (*Same item as* 4.2–288, Feb. 1953, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Infrared spectrum of aurora 3. Yerkes Observatory, Williams Bay, Wisc.**—*M.R.*

5C–182 551.594.5

Meinel, Aden B., **Doppler-shifted auroral hydrogen emission.** *Astrophysical Journal*, 113(1): 50–54, Jan. **1951.** 3 figs., 6 refs. **DWB**—Analysis of spectra obtained during an intense auroral display (Aug. 18–19, 1950) at Yerkes Observatory, show that protons striking the earth's atmosphere at velocities of 3000 km/sec or greater (capable of penetrating to the auroral level) during auroras, provide the main energy source for the auroral spectrum. (*Same item as* 2.9–177, Sept. 1951, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Yerkes Observatory, Williams Bay, Wisc.**—*M.R.*

5C–183 551.594.5

Meinel, Aden B., **Science takes a look at the Northern Lights.** *U. S. Office of Naval Research, Research Reviews*, Sept. **1951.** p. 1–6. 3 figs., refs. **DWB**—A popular account of research on the aurora carried on under the auspices of the ONR. This research was centered on the near-infrared region of the spectrum. The special optical apparatus developed for this research, namely a F/0.8 flat-field Schmidt type camera, are described. The spectra obtained have confirmed the hypothesis that the aurora is caused by the entry of energetic particles, such as radiating hydrogen atoms, into the atmosphere. Also a new band system was identified from the ionized nitrogen molecule. Studies of the airglow revealed that strong emissions in the red and infrared airglow regions were shown to be due to the OH molecule. *Subject Headings:* **1. Auroral research 2. Night airglow.**—*I.L.D.*

5C–184 551.594.51 551.521.4

Meinel, Aden B., **The spectrum of the airglow and the aurora.** *Physical Society of London, Reports on Progress in Physics*, 14:121–146, **1951.** 5 figs., 8 tables, 60 refs. **DLC**—Begins with an account of the spectrum of the night sky from 3000–14,000 Å, consisting of bands due to various gases and a continuous background of uncertain origin. It is attributed to region below 120 km. The characteristic spectrum of the twilight glow is briefly described, and the spectrum of the aurora is discussed and illustrated in detail. The atomic and molecular processes involved are discussed. Temperature estimates from the aurora diverge widely. (*Same item as* 3.3–258, March 1952, *MAB.*) *Subject Headings:* **1. Night airglow spectrum 2. Auroral spectra.**—*C.E.P.B.*

5C–185 551.594.5

Mitra, S. K., **Atomic nitrogen in auroras.** *Nature*, London, 167(4257):897, June 2, **1951.** 10 refs., 2 eqs. **DLC**—Two probable origins for the forbidden N emissions are suggested, involving: 1) dissociative recombination of N_2^+ (X') ions or 2) neutralization of N_2^+ ions by electron transfer in the presence of negative ions of O. Both reactions are likely, and the probability of the first is higher. *Subject Headings:* **1. Auroral spectra 2. Atomic nitrogen 3. Dissociation.**—*Physics Abstracts, No. 7423, 1951.*

5C–186 551.594.51:551.510.535:550.38

Nagata, Takesi, **Development of a magnetic storm: The southward shifting of the auroral zone.** *Journal of Geophysical Research*, 55(2):127–142, June **1950.** 9 figs., 2 tables, 13 refs., 8 eqs. Comment by V. C. A. Ferraro, **The southward shift of the auroral zone during intense magnetic storms.** *Ibid.*, p. 493. **Reply** by Nagata, *ibid.*, 56(2):292–294, June **1951.** table. **MH-BH**—Analysis and theoretical interpretation of data on the auroral and magnetic disturbance of April 10, 1933. The southward shifting of the auroral zone may be due to increase in intensity of the equatorial ring current (Störmer) not to increase in intensity of the corpuscular stream. Theories of Chapman, Ferraro and Alfvén also considered. II. Ferraro points out that Nagata's suggestion that the aurora is due to electrical corpuscles escaping toward the polar regions from the main body of the solar streams upon impinging in the earth's atmosphere is in harmony with the observed fact that the lower limit of the auroral zone is shifted southwards (in the Northern Hemisphere) during intense magnetic storms. III. Points out difference between theories in I and II. Nagata assumes in his theory of the origin of the auroral zone that "the charged particles which impinge on the aurora zone come from around the two points on the front surface of the Chapman-Ferraro stream at which the retardation of propagation at the front becomes zero." (*Same items as* 8–144, Aug. 1950, 2.5–202, May 1951 and 4.3-290, March 1953, *MAB.*) *Subject Headings:* **1. Auroral zones 2. Auroral theories 3. Ionospheric currents 4. Magnetic storms. I. Ferraro, V. C. A.**—*M.R., I.L.D.*

5C–187 551.594.51:535.33

Ol', A. I., **Linii vodoroda v spektre poliarnykh siianiĭ.** [Hydrogen lines in the auroral spectra.] *Priroda*, Moscow, 40(9):46–47, Sept. **1951.** fig., 9 refs. **MH-BH**—Discussion of oxygen, nitrogen and hydrogen spectra which have been observed in various countries during auroral disturbances. Chart shows profile of spectrum of hydrogen lines (Hα) when the spectrograph is oriented toward the magnetic zenith and the magnetic horizon, respectively. Author claims that this proves that the sun emits corpuscles (protons) which reach the earth with speed of 2500–3000 km/sec, or 1.5–2.0 times the usually accepted speed of solar corpuscles activated in the earth's magnetic field (1600 km/sec). It is recognized that particles may be abnormally accelerated during magnetic storms. (*Same item as* 3.5–285, May 1952, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines 3. Magnetic storms.**—*M.R.*

5C–188 551.594.51:539

Petrie, William, **The problems of the excitation of auroral radiations.** Saskatchewan. University. Physics Dept., Contract AF 19(122)-152, Scientific Report, No. AR-4, April **1951.** 11 p. refs. **DWB**—Author discusses ionization and excitation by electrons and protons respectively, then reviews theory of nitrogen and oxygen bands in auroral spectra. A photoelectric study of intensities of forbidden red and green O(I) lines is being conducted, suggesting that levels from which these lines arise are not excited by collision. Some process such as dissociative recombination must operate in producing these radiations. *Subject Headings:* **1. Auroral spectra 2. Dissociation. I. Saskatchewan. University. Physics Dept. II. Contract AF 19(122)-152.**—*From author's abstract.*

5C–189 551.594.51

*Petrie, William and Small, R., **The auroral spectrum in the wave length region 3300–8900 angstroms.** Saskatchewan. University. Physics Dept., Contract AF 19(122)-152, Scientific Report, No. AR-7, [1951?] 17 p. 8 tables, 4 figs., refs. Also in: *Astrophysical Journal*, 116(2): 433–441, Sept. **1952. DWB**—Results of observations with a new spectrograph are given. Photographs of the auroral spectrogram are presented as well as tables with the multiplet designations, the excitation potential of the upper level of the transition and permitted multiplets of low energy which are missing from the spectra. *Subject Headings:* **1. Auroral spectra 2. Spectrographs. I. Saskatchewan. University. Physics Dept. II. Contract AF 19(122)-152.**—*A.A.*

5C–190 551.594.51:551.521.63:535.33

Petrie, William and Small, R., **The intensities of ultraviolet features of the auroral spectrum** Saskatchewan. University. Physics Dept., Contract AF 19(122)-152, Scientific Report, No. AR-5, Aug. **1951.** 14 p. tables, photo. **DWB.** Also in: *Journal of Geophysical Research*, 57(1):

51–57, March 1952. figs., 3 tables, 12 refs., 2 append. **MH-BH**—Twenty-eight ultraviolet spectra of the aurora have been obtained and 15 analyzed with a microphotometer and intensitometer. The intensities have been corrected for the effects of Rayleigh scattering and ozone absorption, and show that they yield vibrational temperatures less than 5000°K. Data are given in tables and an example of a polar aurora ultraviolet spectrum reproduced. (*Same item as* 4.2–289 and 4.5–234, Feb. and May 1953, *MAB*.) *Subject Headings:* **1. Auroral spectra 2. Ultraviolet intensities 3. Ultraviolet spectrum. I. Saskatchewan. University. Physics Dept. II. Contract AF 19(122)-152.**—*From authors' abstract.*

5C–191 551.594.5

Shklovskiĭ, I. S., **O mekhanizme vozbuzhdeniia svecheniia poliarnykh siianiĭ.** [Excitation mechanism of the luminescence of auroras.] *Akademiia Nauk SSSR, Doklady*, 81(4):525–528, **1951.** 9 refs., 4 eqs. **DLC**—The weakness of the permitted lines of O and N compared with the forbidden lines can be explained by the excitation potentials being low for the latter and high for the former. The existing theories relating to the excitation mechanism of the negative system of N molecules in auroras are criticized, and a selective mechanism is suggested, based on the assumption that the negative system is the only kind of emission proper to ionized particles. It is claimed that the only possible elementary process is the reaction (transference of charge) between the primary proton (or ionized He) with a N molecule, yielding an ionized N molecule $[N_2^+(A^2\Sigma)]$. *Subject Headings:* **1. Auroral luminescence 2. Ionization.**—*Physics Abstracts, No. 6227, 1952.*

5C–192 551.594.5:535.338.4

Shklovskiĭ, I. S., **Ob izluchenii vodorodnykh liniĭ v spektrakh poliarnykh siianiĭ.** [Emission of hydrogen lines in the spectra of auroras.] *Academiia Nauk SSSR, Doklady*, 81(3):367–370, **1951.** 7 refs., 2 eqs. **DLC**—Protons of solar origin yield neutral H atoms which are excited by collisions with atoms and molecules of the terrestrial atmosphere. The peculiarities of the elastic and non-elastic collisions of H atoms endowed with a velocity of c. 1000 km/sec can account for the penetration of these atoms to a height of 115-120 km (the usual level of auroras). Contours of the Hα line observed in the spectrum of auroras can be explained by assuming that corpuscles penetrating into the atmosphere have a broad velocity spectrum. The concentration of H atoms of solar origin is estimated at $[H]=0.6$ cm^{-3} from the formula

$$I=\frac{h\nu}{4\pi}\int_{S_0}^{\infty}[H][N]\sigma dS=\frac{h\nu}{4\pi}[H]V\sigma\int_{S_0}^{\infty}[N]dS$$

where σ=the effective cross-section of excitation by collision with the atmospheric molecules, V—velocity of H atoms (1000 m/sec), I—intensity of Hα (3×10^{-4} erg/cm^2 sec$\times$steradian), S_0—lower limit of aurora altitude (115 km), and $[N]$—the concentration of molecules in the atmosphere. *Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines.**—*Physics Abstracts, No. 6941, 1952.*

5C–193 551.508:551.594.51

*Vegard, Lars and Kvifte, G., **An auroral spectrogram and the results derived from it.** *Geofysiske Publikasjoner*, Oslo, 18(3), **1951.** 23 p. 11 figs., 2 tables, 14 refs., 4 eqs. **MH-BH**—The spectrogram was photographed by a new instrument and 310 new lines were found. Auroral lines from 8858 to 3114 Å are given. The results are compared with previous measurements. The ionospheric temperature determined by means of the N_2^+ band 3914 is found to be −54.1°C. (*Same item as* 3.5–74, May 1952, *MAB*). *Subject Headings:* **1. Auroral spectra 2. Temperature of the ionosphere 3. Spectrographs.**—*A.A.*

5C–194 551.593.9:551.594.5:551.510.535

†*Vegard, Lars; Tønsberg, Einar and Kvifte, G., **Continued investigations on the spectra of aurora and twilight and the ionospheric temperature.** *Geofysiske Publikasjoner*, 18(4), **1951.** 16 p. numerous figs., plates, tables and refs. **DLC**—An analysis of spectrograms of aurora and twilight obtained during 1942–48 for the following purposes: 1) for spectral analysis to detect and measure weak lines, 2) to obtain negative nitrogen bands with a dispersion and density suitable for measuring ionospheric temperature at different altitudes and in sunlit atmosphere, 3) to study variations of spectral intensity distribution and 4) for investigation of the yellow sodium line in twilight. Results are presented in tables and diagrams. *Subject Headings:* **1. Auroral spectra 2. Twilight spectra 3. Temperature of the ionosphere.**—*M.L.R.*

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5C–195 551.521.61:551.594.51:535.33

Bagariatskiĭ, B. A., Krasovskiĭ, V. E. and Mordukhovich, M. I., **K voprosu ob infrakrasnom izluchenii nochnogo neba i poliarnykh siianiĭ.** [On the problem of infrared radiation of the night

sky and aurora.] *Akademiia Nauk SSSR, Doklady*, 82(4):579–580, **1952.** table, 2 refs. **DLC**—During March, 1951, 4 spectra were obtained of the aurora in the 8000–11,000 Å (near infrared) bands, and one of the night sky light in the absence of an aurora. Results of line intensity measurements of the spectrophotographs are tabulated (for 7800, 8400, 8700, 9200 and 10,000 Å). It was noted that, although little regional or time variation was found, there was a marked diminution of intensity in the infrared of the night sky during auroral displays. Later (mid-August, 1950) it was found there was an almost total absence of night sky radiation (.8–1.1μ) at Simeiz (Aug. 18–20, 195 auroras observed all over the Northern Hemisphere.) (*Same item as* 3.10–154, Oct. 1952, *MAB.*) *Subject Headings:* **1. Infrared radiation 2. Night airglow 3. Auroral spectra 4. Infrared spectrum of aurora.**—*M.R.*

5C–196 551.594.51:551.521.61:535.33

Bagariatskiĭ, B. A. and Mordukhovich, M. I., **Spektry poliarnykh siianiĭ v infrakrasnoĭ oblasti.** [Spectra of aurora borealis in the infrared region.] *Akademiia Nauk SSSR, Doklady*, 82(1):45–47, Jan. 1, **1952.** 2 figs., 4 refs. **DLC**—The spectrum of the aurora borealis in the infrared region up to a wave length of 11,000 Å is analyzed. The following spectral regions are established and described; these are: 7400–7600 Å, 7650–7900 Å, 8100–8150 Å, 8250 Å, 9050–9300 Å, 9300–9550 Å, 9800–10,500 Å and 10,800 Å. The spectrum of the aurora borealis is characterized by two regions, around 8000–8150 Å and 9050–9300 Å, which are not observed in the light of night sky. The regions 7650–7900 Å and 8550–8950 Å are more intense in auroral spectra than in spectra of the night sky. The region 9800–10,500 Å is lacking in the auroral spectrum. The first positive system of molecular oxygen was not found in the spectra. The expected region (O-O) at 10,400 Å was lacking. (*Same item as* 3.11–134, Nov. 1952, *MAB.*) *Subject Headings:* **Auroral spectra 2. Infrared spectrum of aurora.**—*I.L.D.*

5C–197 551.594.51:550.385

Chapman, Sydney (*Queen's College, Oxford*), **Theories of the aurora polaris.** *Annales de Géophysique*, 8(2):205–225, April/June **1952.** 6 refs., eqs. French and English summaries p. 205. **DWB**—An interpretation of auroras and magnetic storms as conceived by the author, in co-operation with Ferraro, is suggested. The theory is based upon an investigation by exact mathematical methods, which, however, has not yet been completely followed through. It is assumed that a stream of neutral ionized gas ejected from the sun advances into the earth's magnetic field at a sonic speed, 100 times smaller than the speed of the earth. The physical processes connected with the passage of the earth through the stream of gas are discussed. Other auroral theories, particularly that of Alfvén, are reviewed and criticized. *Subject Headings:* **1. Auroral theories 2. Magnetic storms.**—*G.T.*

5C–198 551.594.5:535.33

Chicago. University. Yerkes Observatory, **Spectroscopic investigations of the aurora.** Contract AF 19(122)-480, Progress Reports No. 3 and 4, Sept. 1, 1951–Jan. 31, **1952** and Feb. 1–May 31, **1952.** 2 pieces. figs., refs. Photostat. **DWB**—Indicates the following lines along which investigation is being undertaken: statistical studies of the aurora, search for recurrence periodicities of auroras, stereograph determination of height of origin and position of auroral spectra, determinations of hydrogen emissions and velocities in the aurora, determination of upper atmosphere temperatures by spectrographic techniques, time sequence studies of variations in auroral spectra, identification of certain band systems found in the airglow and aurora, investigation of proton interactions and spectroscopic interactions of protons with atmospheric gases. Titles of publications completed during the report period are included. *Subject Headings:* **1. Auroral research 2. Auroral spectroscopy. I. Contract AF 19(122)-480.**—*M.L.R.*

5C–199 551.594.51:550.385

Dungey, J. W., **Theories of magnetic storms and aurorae.** *Nature*, London, 170(4332):795, Nov. 8, **1952.** 6 refs. **DWB**—In opposition to the theories of Alfvén and Martyn, author finds that charged auroral particles in a solar magnetic field are accelerated only at neutral points. (*Same item as* 4.3–291, March 1953, *MAB.*) *Subject Headings:* **1. Auroral theories 2. Magnetic storms.**—*C.E.P.B.*

5C–200 551.594.51:546.11

Gartlein, Carl W., **The appearance of hydrogen in auroral spectra 1942–1951.** *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, 12(1/2):195–198, **1952.** 5 figs. **DLC**—Discussion of data obtained from a study of low dispersion spectrograms. The spectra were studied visually and with the microphotometer. About 16 separate features could be distinguished and the H_α, H_β and H_γ lines could be located with certainty. The plates showed hydrogen on 77 nights; they also showed that peak intensity of hydrogen precedes or is simultaneous with strong N_2^+ bands. A graph of

Hβ occurrence by months for 10 years (1942–1951) shows two broad peaks corresponding to spring and fall, a distribution similar to that of auroras and magnetic storms. These and other statistics "support the idea that hydrogen radiation is characteristic of the aurora." *Subject Headings:* **1. Auroral hydrogen lines 2. Auroral spectra.**—*M.L.R.*

5C–201 551.594.51

Gartlein, Carl W. and Sherman, Dora F., **Identification of O_2^+ bands and forbidden nitrogen in auroral spectra.** *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, 12(1/2):187–190, **1952.** 2 figs., 3 refs. **DLC**—Fourteen spectra, taken from 1939 to 1946, were used to identify the various features in auroral spectra between 4708 and 5800 Å. Evidence is given for the existence of O_2^+, N_2^+, (NI) and N II in auroral spectra. *Subject Heading:* **1. Auroral spectra.**—*M.L.R.*

5C–202 551.594.51:546.11

Gartlein, Carl W. and Sprague, G., **First positive bands of nitrogen in auroral spectra.** *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, 12(1/2):191–193, **1952.** table. **DLC**—Plates obtained at Cornell University on June 18, July 2 and Aug. 2, 1951 were used to study the H_α line in auroral spectra gratings. "Except for the forbidden oxygen lines and hydrogen alpha line, the positive nitrogen bands are the most prominent feature." . . . "The position of the measurement on microphotometric tracings using neon standards" and the results are shown in a table. Separation between band heads is larger when the hydrogen is more intense. "This indicates higher rotational temperatures during time of arrival of hydrogen." *Subject Headings:* **1. Auroral hydrogen lines 2. Auroral spectra.**—*M.L.R.*

5C–203 551.510.41:551.594.5

Harang, Leiv (*Norwegian Defense Res. Est., Kjeller*), **Constitution of the upper atmosphere as determined from auroral studies.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:55–66, **1952.** 3 figs., 15 refs. **DWB**—The height distribution of the aurora in space, the spectrum of the aurora, and the nature of the luminosity curve, the pressure, density, temperature and composition of the upper atmosphere can be determined in some cases precisely, and in others approximately. Latitude effects are discussed and illustrated, and the importance of sunlit aurora for determining character of atmosphere to a height of more than 1000 km mentioned. However, the nature or cause of the aurora itself is still uncertain. (*Same item as* 4.9–68, Sept. 1953, *MAB*). *Subject Headings:* **1. Auroral physics 2. Upper atmosphere research.**—*M.R.*

5C–204 551.594.51

†Harang, Leiv, **Spectrum des Polarlichtes.** [Spectrum of auroras.] (In Landolt-Börnstein, **Zahlenwerte und Funktionen.** 6th ed. edited by Arnold Eucken. Berlin, Springer, **1950–52.** v. III, Astronomie und Geophysik, Paragraph 32936, p. 772–773. fig., table, refs.) **DLC**—Contains table of identified auroral bands, according to VEGARD, and an extensive list of references. *Subject Heading:* **1. Auroral spectra.**—*M.R.*

5C–205 551.594.5:551.510.535

Heppner, J. P., Byrne, E. C. and Belon, A. E. (*Univ. of Alaska, College, Alaska*), **The association of absorption and Es ionization with aurora at high latitudes.** *Journal of Geophysical Research*, 57(1):121–134, March **1952.** 6 figs., 2 tables, 8 refs. **MH-BH**—Nocturnal Es ionization and "no echo" occurrences, as recorded on H'f records, have been classified according to the absence or presence of aurora and to its form when present in the zenith areas. The analysis supports the following generalizations: 1) Es ionization increases at successively greater heights as aurora approaches the College zenith from the north. 2) In the presence of different non-pulsating auroral forms the Es ionization varies with changes in auroral form in a manner similar to the change in luminosity. Likewise, variations in the height of maximum ionization parallel variations in auroral heights. 3) Complete absorption is only slightly more frequent during non-pulsating aurora than during absence of aurora but prevails in the presence of pulsating aurora. Geomagnetic relationships are discussed. (*Same item as* 4.2–286, Feb. 1953, *MAB.*) *Subject Headings:* **1. Sporadic E layer (Es) ionization 2. Auroral types 3. Magnetic storms 4. Aurora and sporadic E layer 5. College, Alaska.**—*Authors' abstract.*

5C–206 551.594.51:535.33

Herman, Renée, Herman, Louis and Hepner, Georges, **Processes of emission of the molecular and atomic spectra of nitrogen observed in the light of the polar aurora.** *American Geophysical Union, Transactions*, 33(4):489–494, Aug. **1952.** 8 figs., 7 refs. **MH-BH**—The discharge and afterglow spectra in a mixture of helium and nitrogen with traces of oxygen and hydrogen were studied under very low, moderately low, intermediate and very high pressures of nitrogen. The apparent excitation of the spectrum is much higher in the afterglow than in the discharge. The

recombination of the N_2^+ ions and electrons is followed, not by the emission of the triplet band systems, but by that of the singlet band systems. These bands are to be expected in the near ultraviolet of the spectrum of the aurora. The possible emission mechanisms that might explain the spectrum of the aurora are discussed. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands.**—*From author's abstract.*

5C–207 551.510.535:551.557:550.385

Little, C. G. and Maxwell, A., **Scintillation of radio stars during aurorae and magnetic storms.** *Journal of Atmospheric and Terrestrial Physics*, London, 2(6):356–360, **1952.** 3 figs., 6 refs. **DWB**—Scintillations of radio stars on 3.7 m during auroras of Sept. 25 and Oct. 28, 1951, averaged 4 or more per minute compared with 1–2 in normal conditions. On Oct. 28 a 10% decrease of signal intensity at maximum aurora. Scintillation rate also has high + correlation with geomagnetic K index. Records of receivers 3 km apart show that changes of fluctuation rate are due to changes in speed of passage of quasi-stable disturbances, which may be about 120 km across. During aurora, average wind speed in upper ionosphere was about 400 m/sec; changes in scintillation rate are due to changes in this velocity. (*Same item as* 4.3–104, March 1953 *MAB.*) *Subject Headings:* **1. Ionospheric variations 2. Ionospheric winds 3. Auroral effects on radio propagation 4. Magnetic storms.**—*C.E.P.B.*

5C–208 551.594.51

Martyn, D. F. (*Commonwealth Sci. and Ind. Res. Org., Canberra*), **A note on the mechanism of magnetic storms and aurorae.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:283–285, **1952.** 8 refs., 2 eqs. **DWB**—An attempt to explain: 1) the disturbance of daily variation (S_D), 2) the mode of formation and 3) the reason for the existence of the ring current as well as 4) the high penetrating power of the particles producing auroras in high latitudes. Using the hydrodynamical theory and derived analogies, a clear interpretation of the observed S_D ($f°F2$ and h_{F_2}) variations is made. It is suggested that a Hall current causes the S_D variations. *Subject Headings:* **1. Auroral physics 2. Magnetic disturbances.**—*W.N.*

5C–209 551.594.51

Meinel, Aden B., **Excitation mechanisms in the aurora.** *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, 12(1/2):203–213, **1952.** 5 figs., 5 refs. **DLC**—Observations of the spectrum made by the author during the auroral storm of Aug. 18–20, 1950 showed, for the first time, Doppler displacements γ/H_α (6562 Å). "The asymmetrical violet wing on H_α in the magnetic zenith extends 70 Å to the violet at a deflection 1/10 the maximum ordinate." Suggests two methods of attacking auroral excitation problems: 1) use of the fastest possible spectrograph and 2) photoelectric comparison of different auroral emissions. *Subject Headings:* **1. Auroral excitation mechanisms 2. Doppler effect.**—*M.L.R.*

5C–210 551.594.51:535.338.1

Meinel, A. B. and Fan, C. Y., **Laboratory reproduction of auroral emission by proton bombardment.** *Astrophysical Journal*, Chicago, 115(2):330–331, March **1952.** fig. **DLC**—Describes an experiment using protons from the Kevatron at the Institute for Nuclear Studies, University of Chicago to determine the part played by the protons in exciting the auroral emissions. Photos show spectrum emitted by the air under proton bombardment and spectrum of the aurora. The authors point out similarities and differences between the laboratory spectrum and the auroral spectrum, but state that the similarities do not conclusively indicate that protons offer a more satisfactory explanation of auroras than electronic excitation does. More adequate tests using electrons are necessary. (*Same item as* 4.3–292, March 1953, *MAB.*) *Subject Headings:* **1. Auroral emissions 2. Experimental auroral spectra 3. Solar proton theory.**—*M.L.R.*

5C–211 551.594.5:535.33

Nicholls, R. W., **The analysis of molecular excitation processes.** *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, 12(1/2):305–316, **1952.** fig., 14 refs., 18 eqs. **DLC**—Theory of "excitation kinetics" as applicable to spectroscopic analysis of band systems in glow discharges (particularly N_2) such as occur in the aurora and night airglow. *Subject Headings:* **1. Excitation kinetics 2. N_2 dissociation 3. Auroral spectroscopy.**—*M.R.*

5C–212 551.594.51

Nicholls, R. W., **Intensity measurements of molecular spectra. 1. Spectroscopic intensities and photographic blackening.** London, Ontario. University of Western Ontario. Dept. of Physics, Contract AF 19(122)-470, Scientific Report, No. 1, Oct. 22, **1952.** 16 p. 3 figs., 2 tables, 6 refs., 13 eqs. **DWB**—A method is described which allows meaningful information pertaining to source condition to be derived directly from microdensitometer traces of spectra of the source in question.

It is not intended to supplant the unquestioned superior, though more laborious, method of photographic photometry normally required before photographic spectra can be interpreted from an intensity standpoint. Rather it is proposed as a useful survey method that can be applied relatively rapidly to plates taken from various source conditions. When usual excitation conditions are shown probably to exist by this method, then a full photometric study can be made. In addition to the density measurements, the method also requires some knowledge of the fractional transition probabilities involved in the transition, which for bands of auroral interest are becoming available. (*Same item as* 4.7–225, July 1953, *MAB.*) *Subject Headings:* **1. Auroral spectrum measurement. I. London, Ontario. University of Western Ontario. Dept. of Physics II. Contract AF 19(122)-470.**—*Author's summary.*

5C–213 551.594.5:546.17

Nicolet, M. and Pastiels, R., **Atomic and molecular nitrogen in the high atmosphere.** *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, 12(1/2):147–149, **1952. DLC**—Notes on evidence of recombination rates and resulting proportion of atomic to molecular N and O in the auroral zone. Below 100 km the effect of complete dissociation is negligible after one day. At 200 km the recombination does not appear over many years so atomic N is a permanent element. In auroras where electronic concentration is $\geq 3 \times 10^7$ the formation of N_2^+ may be increased. *Subject Headings:* **1. Atomic nitrogen 2. Recombination and dissociation in chemosphere.**—*M.R.*

5C–214 551.594.51

Oldenberg, O., **Anregung des sonnenbestrahlten Nordlichtes.** [Excitation of sunlit auroras.] *Zeitschrift für Physik;* 133(1/2):15–20, **1952. DLC**—Spectrograms of sunlit auroral rays show enhanced forbidden OI line at 6300 Å, and also blue bands of N_2^+; whereas auroral emissions in the earth-shadow exhibit no enhancement of the blue bands. To explain this, fluorescence, in addition to electronic excitation is evoked, following the theory of BATES (1949). *Subject Headings:* **1. Sunlit auroral spectra 2. Auroral spectra 3. Electronic excitation of auroras.**—*Physics Abstracts, No. 2103, 1953.*

5C–215 551.594.51

Petrie, William (*Univ. of Saskatchewan*), **Forbidden line of N II in the aurora.** *Physical Review*, 87(15):1002, Sept. 15, **1952.** table, 2 refs. **DWB**—Very brief discussion of the likely cause of the O II and the N II forbidden lines of the auroral spectrum. A table gives the relevant data of these lines in the wave lengths examined; simultaneously presenting the Einstein A value of each multiplet. *Subject Headings:* **1. Forbidden N lines 2. Auroral spectra.**—*W.N.*

5C–216 551.594.51

Petrie, William, **Rotational temperatures of Vegard-Kaplan auroral bands.** *Physical Review*, 86(5):790–791, June 1, **1952.** 3 refs. **DWB**—The mean temperature derived from the positions of branch maxima of five $'\epsilon g^+ - {}^3\epsilon_u{}^+ N_2$ bands in the wave length range λλ 3400–3800 was found to be 850°K, using photographs of spectra of several intense auroral displays. These results are more in conformity with estimates of particle density at about 200 km than VEGARD's values of about 350°K derived from N_2^+ band spectra. (*Same item as* 4.5–235, May 1953, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Upper air temperatures.**—*A.A.*

5C–217 551.594.5:551.521.4

Petrie, William and Small, R., **Additional OH lines in the airglow spectrum.** Saskatchewan. Univ. Physics Dept., Contract AF 19(122)-152, Scientific Report, No. AR-8, March **1952.** 3 p. table, 3 refs. **DWB**—Since the auroral spectrograph in use at Saskatoon (on all clear nights) for the past year has a higher dispersion than those used by CABANNES, DUFAY and MEINEL, the data listed in this report (from 40 plates) contains more OH lines than previous investigations showed. Since Saskatoon is close to zone of maximum auroral frequency, it is not so good a place to investigate airglow. The negative N_2^+ bands appeared whether or not an aurora was visible. *Subject Headings:* **1. Night airglow spectrum 2. Spectrographs. I. Saskatchewan. Univ. Physics Dept. II. Contract AF 19(122)-152.**—*M.R.*

5C–218 551.594.51:535.33:551.521.63

Petrie, William and Small, R., **The intensities of ultraviolet features of the auroral spectrum.** *Journal of Geophysical Research*, 57(1):51–57, March **1952.** figs., 3 tables, 12 refs., 2 append. **MH-BH**—Twenty-eight ultraviolet spectra of the aurora have been secured at Saskatoon with a single prism quartz spectrograph. Fifteen of these plates have been analyzed with a microphotometer and intensitometer, and integrated relative intensities obtained of the main spectral features. The intensities have been corrected for the effects of Rayleigh scattering and ozone absorption. The corrected intensities are carefully discussed, and it is shown that they yield vibrational temperatures

less than 500°K. This is very different from earlier results, and additional measurements are desirable. (*Same item as* 4.2–289, Feb. 1953, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Ultraviolet spectrum 3. Ozone absorption 4. Saskatoon, Saskatchewan.**—*Authors' abstract.*

5C–219 551.594.51

*Petrie, William and Small, R., **The auroral spectrum in the wave-length range 3300–8900A.** *Astrophysical Journal*, 116(2):433–441, Sept. **1952.** 5 figs., 8 tables, 11 refs. **DLC**—Some hundred and fifty spectra of the aurora have been secured with a grating instrument which produces linear dispersion of 85A/mm in the first-order spectrum. The first three orders of the grating have been used in obtaining these spectra. Tables have been prepared listing those features whose origin is certain, and these data will provide useful information for a study of the excitation of the aurora. Remarks are made about any apparent anomalies in the spectra. *Subject Heading:* **1. Auroral spectra.**—*Authors' abstract.*

5C–220 551.594.5:014.3

***Physical Review Index, 1921–1951, v. 17–80. Subject Index.** Prepared under the direction of J. W. Buchta, asst. ed., 1930–1950. Pub. for the American Physical Society . . . by the American Institute of Physics, N. Y., **1952.** 498 p. **DLC**—In sec. (167), "Geophysics, atmosphere absorption spectra, night sky" (p. 196–197) there is listed the titles of approximately 25 articles on aurora, particularly auroral spectra. A previous index, 1893–1920, pub. 1921, indexes v. 1–15, 1893–1912 and Ser. 2, v. 1–16, 1913–1920. (For fuller abstract *see* 5.1–7, Jan. 1954, *MAB.*) *Subject Headings:* **1. Auroral bibliographies 2. Geophysics bibliographies. I. American Physical Society II. American Institute of Physics III. Buchta, J. W.** (*asst. ed.*).—*M.L.R.*

5C–221 551.594.51

Sayers, N. D. and Emeleus, K. G. (*Queen's Univ., Belfast*), **Experiments on production of auroral radiation.** *Physical Society of London, Proceedings, Ser. A*, 65, Pt. 3(387):219–226, March 1, **1952.** 3 figs., 14 refs. **DWB**—Further experiments have been made on the production in the laboratory of the "forbidden" red and green auroral lines, and the ultraviolet transauroral line of OI. The mean concentration of oxygen atoms in the 1^1S_0 and 5^5D states in the columns has been found from absolute intensity measurements. The decay of the green radiation produced by a Tesla discharge through a high pressure source has been investigated with a photomultiplier tube. It occurs at approximately the rate to be expected if the atoms in the 'S state are undergoing spontaneous transitions to lower atomic levels, but complicating factors make it difficult to deduce transition probabilities from the experiment. (*Same item as* No. 5.1–311, Jan. 1954 *MAB.*) *Subject Headings:* **1. Auroral emissions 2. Experimental auroral spectra.**—*Authors' abstract.*

5C–222 551.594.51

†SHklovskiĭ, I. S., **O prirode svecheniia poliarnykh siianiĭ.** [The nature of auroral luminescence.] *Akademiia Nauk SSSR, Krymskaia Astrofizicheskaia Observatoriia, Izvestiia*, 8:51–78, **1952.** fig., 31 refs., 10 eqs. **DLC**—An extensive discussion of the theory of auroral luminescence, based on the latest works of Bates, Meinel, Vegard, Chapman, and SHklovskiĭ. The interpretation of hydrogen lines, latitude effects, dissociation and recombination, the mechanism giving rise to the luminescence and the theoretical aspects of the solar electron-proton system, the kinetic temperature effect of corpuscles on chemical composition of atmosphere, etc. are discussed. *Subject Headings:* **1. Auroral theories 2. Auroral luminescence 3. Auroral spectra.**—*M.R.*

5C–223 551.593

Société Royale des Sciences de Liège, **Études optiques de l'atmosphère terrestre.** [Optical studies of the earth's atmosphere.] *Société Royale des Sciences de Liège, Mémoires, 4th Ser.*, v. 12, Pts. 1–2, **1952.** 319 p. figs., tables, refs. In French or English. **DLC**—Contains 31 papers presented at the international conference on Optical Study of the Terrestrial Atmosphere held at the Institut d'Astrophysique of the University of Liège on Sept. 3–4, 1951. The papers covered the following subjects: height determination of the layers emitting characteristic radiations of the night sky (night airglow) and the excitation mechanisms of these radiations, crepuscular phenomena, infrared absorption by the earth's atmosphere, aurora borealis, zodiacal light and laboratory studies on the high atmosphere. Abstracts of those papers applicable to the subject of this bibliography have been included. *Subject Headings:* **1. Auroral research 2. Night airglow. I. Liège. Université. Institut d'Astrophysique (Colloquium on the Terrestrial Atmosphere, Sept. 1951).**—*M.L.R.*

5C–224 551.594.51 551.521.4

†Swings, Pol (*Liège Univ.*) and Meinel, A. B. (*Yerkes Obs. Chic. Univ.*), **The spectra of the night sky and the aurora.** (In: Kuiper, Gerard P. (*ed.*), **The atmospheres of the earth and planets.** Rev. ed. Chic., Univ. of Chic. Press, **1952.** p. 159–210. figs., table, foot-refs., eqs.) **DWB**—

This chapter is a revision of that published in the first edition of the book and is the most important change in the new edition. It consists of the following sections: 1) Description of the night sky and twilight spectra including an account of the molecular bands: Meinel system of OH, atmospheric system of O_2, the Vegard-Kaplan (ϵ) system of N_2, the Herzberg system of O_2, other possible O_2 systems and the Cameron bands of CO, negative bands of N_2^+. Ozone O_3, β and γ systems of NO, etc.; temperature determined on the basis of the rotational intensity distribution in the molecular bands, determination of heights of emission, intensity variation and twilight phenomena. 2) Description of the auroral spectra including atomic lines and molecular bands and temperatures based upon rotational and vibrational intensity distributions. 3) The relation between the night sky aurora and ionosphere, N_2 in the upper atmosphere. The photodissociation of O_2, the ionization of N_2 as revealed by auroral and twilight spectra, ionization of O_2, as revealed by auroral spectra, temperature of the upper atmosphere, classification of emissions according to their intensities, mechanism of excitation of the intense infrared night-sky radiation, night-sky emission interpreted as a conversion dissociation energy into excitation energy mechanism of excitation of the night sky based on the ionized layers, interpretation of twilight aspects and mechanism and excitation of the aurora. *Subject Headings:* **1. Auroral spectra 2. Night airglow spectrum.**—*I.L.D.*

5C–225 551.594.5

*Vegard, Lars, **Auroral spectroscopy and its bearing on the physics of the ionosphere and on solar-terrestrial relationships.** *International Council of Scientific Unions. Eighth Report of the Commission for the Study of Solar and Terrestrial Relationships*, Rome, **1952.** p. 33–35. 16 refs. **DWB**—Describes types of spectrographs needed for the (1) detection, wavelength measurement and interpretation of bands and lines in auroral luminescence and (2) study of variations in the spectral composition of auroral light. Summarizes results of investigations at Tromsø. The 16 references are to the author's work. *Subject Headings:* **1. Auroral spectroscopy 2. Norway.**—*M.L.R.*

5C–226 551.594.51

Vegard, Lars, **Doppler displacement of auroral hydrogen lines and its bearing on the theory of aurora and magnetic disturbances.** *Geofysiske Publikasjoner*, Oslo, 18(5), **1952.** 15 p. 4 figs., 4 tables, 39 refs., eqs. **DLC**—Previous theories of aurora and magnetic storms are reviewed and the spectrographic detection of hydrogen (H) lines and their Doppler displacement explained. A detailed analysis of the Doppler displacement of H_β lines from spectrograms obtained at Tromsø and Oslo in 1940–41 and 1950 and 51 is then presented. A uniform distribution of gases in the atmosphere is assumed in calculations which give the energy of electron and proton rays which must be assumed if these rays are to reach the levels of 100 km (or 65 km as occurs in extreme cases). The electrons are shown to dominate production of luminescence since only electrons could reach these levels. Protons which accompany the electrons make the bundles of rays electrostatically neutral and though travelling at lower speeds produce a deviation when entering the earth's magnetic field that accounts for the distance between the magnetic axis and the auroral band. If the proton velocity is greater, the deflection of the bundles is greater and so the intensity of the H lines increases with increasing distance from the magnetic pole. *Subject Headings:* **1. Auroral theories 2. Doppler effect of H_β lines 3. Auroral hydrogen lines.**—*M.R.*

5C–227 551.594.51

Vegard, Lars, **Enhancement of auroral hydrogen lines towards lower latitudes.** *Nature*, London, 170(4339):1120–1121, Dec. 27, **1952.** 10 refs., 2 eqs. **DLC**—Author's view that auroras and magnetic disturbances are due to solar electric rays of electrons and protons is proved by occasional appearance in auroral luminescence of hydrogen lines due to high velocity protons. These shift aurora towards lower latitudes. *Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines.**—*C.E.P.B.*

5C–228 551.594.51

Vegard, Lars, **Great intensity variations of H_α and effects in auroral spectrogram taken in rapid succession.** *Nature*, London, 170(4326):536–537, Sept. 27, **1952.** fig., 12 refs. **DWB**—Four spectrograms taken at Tromsö, Dec. 3, 1951, are reproduced and discussed. Two show hydrogen lines, two do not. This is discussed in terms of energy and neutralization of solar protons. (*Same item as* 4.2–290, Feb. 1953, *MAB.*) *Subject Heading:* **1. Auroral spectra.**—*C.E.P.B.*

5C–229 551.594.51

Vegard, Lars, **Recent advances in auroral spectroscopy and in our knowledge of the upper atmosphere.** *Annales de Géophysique*, 8(1):91–99, Jan./March **1952.** 3 tables, 17 refs. French summary p. 91. **DWB**—The author refers to earlier papers in which he reported the existence of H-lines in the auroral spectrum. In further pursuit of his investigation he has installed a double-

prism spectrograph at the Auroral Observatory at Tromsø. The instrument, designed by the author, was constructed by Société Générale Optique. Data obtained with the instrument are briefly summed up and discussed. They appear to indicate the usefulness of the apparatus in auroral studies and in temperature determinations. (*Same item as* 4.10–265, Oct. 1953, *MAB.*) *Subject Headings:* **1. Auroral spectroscopy 2. Spectrographs.**—*G.T.*

5C–230 551.594.5

Vegard, Lars, **Vannstoffjoner (protoner) fra solen og deres betydning for nordlysteorien.** [Hydrogen ions (protons) from the sun and their significance for auroral theory.] *Naturen*, 76(17):514–528, **1952.** 5 figs., 2 eqs. **DLC**—A limited ray beam: $i = en\ (Ve - Vp)$, where i = currency density of the beam, e = the electric quantity, n = the positive particles and Ve and Vp, respectively, the speed of the electrons and the protons, will be bent in the earth's magnetic field, confirming the BIRKELAND-STÖRMER theory. It is concluded that heavy ionized Na ions come from the sun and occur in the ray beam (for which evidence for the existence of positive H ions is given) that are responsible for auroras and magnetic storms. The luminous night clouds may be explained as a combination of H and Na with O into water vapor and sodium oxide, the latter forming condensation nuclei for the former. *Subject Headings:* **1. Solar proton theory 2. Birkeland-Störmer theory.**—*W.N.*

5C–231 551.594.51:551.508.99

†*Vegard, Lars and Tønsberg, Einar. **Results from auroral spectrograms obtained at Tromsø during the winter 1950–51.** *Geofysiske Publikasjoner*, Oslo, 18(8), **1952.** 20 p. 4 figs., 3 tables, 28 refs., 3 plates, eqs. **DLC**—Includes an extensive table comparing the wave lengths previously measured with those from more recent spectrograms obtained at the Auroral Observatory at Tromsø in 1950 with an improved spectrograph which has a much higher light power. Discusses the Doppler displacement of auroral hydrogen lines. On spectrograms here reproduced, Hβ appears quite strong and with Doppler effect in one case, and less strong in another. Measurements in ionosphere, based on the negative nitrogen bands 3914(1) and 4278(2), gave temperature of −56°C. Spectrograms obtained at Tromsø during the winter of 1950–51 and at Oslo in Feb. 1950 are reproduced. (*Same item as* 4.10–266, Oct. 1953, *MAB.*) *Subject Headings:* **1. Auroral spectra 2. Doppler effect 3. Auroral hydrogen lines 4. Temperature of the ionosphere 5. Spectrographs.**—*M.L.R.*

5C–232 523.74:550.38 527.74:551.594.5

Waldmeier, M., **Die Entdeckung der solarterrestrischen Beziehungen im Jahre 1852.** [Discovery of solar-terrestrial relationship in 1852.] *Sternenwelt*, Munich, 4(9/10):163–166, **1952. DLC**—A brief summary of the work of RUDOLF WOLF (1816–1893) with respect to the strong relationship between sunspot number and magnetic declination, which discovery was announced July 31, 1852 (100 years ago) at the Naturforschenden Gesellschaft zu Bern. The 10.3 year (later found to be 11.11 year) cycle was based on LAMONT's discovery of a 10.3 year cycle in the magnetic declination (at Munich) and SCHWABE's (at Dessau) discovery of a 10 year period in sunspots. Previous workers had also mentioned the latter. WOLF tested the relation of sunspots to many other physical and biological factors but found little of interest except the strong auroral sunspot relationship which FRITZ investigated more thoroughly a decade later. *Subject Headings:* **1. Solar terrestrial relationships 2. Auroral solar relationships. I. Wolf, Rudolf II. Fritz, Hermann.**—*M.R.*

1953

5C–233 551.594.5:551.507.42

B——, F. D., **Razzi per lo studio delle aurore boreali.** [Rockets for the study of the aurora borealis.] *Rivista di Meteorologia Aeronautica*, 13(1):55, Jan./March **1953. MH-BH**—Projected use of Viking rockets for study of aurora in Norway, under sponsorship of U. S. Navy (O.N.R.) is told by ERIK BERGAUST; Norwegian writer. The ascents will be made near Tromsö where STÖRMER has his institute for study of the aurora, and at a latitude more favorably located with respect to the auroral zone than any place in the U.S.A. The rockets are equipped with special photographic equipment and will penetrate well into the auroral zone. *Subject Headings:* **1. Auroral research with rockets 2. Viking rockets 3. Tromsö, Norway. I. Bergaust, Erik.**—*M.R.*

5C–234 571.594.5:551.521.64

Bennett, W. H. and Hulburt, E. O. (*Naval Res. Lab., Wash., D. C.*), **Magnetic self-focusing of auroral protons.** *Physical Review*, 91(6):1562, Sept. 15, **1953.** 4 refs. **DWB**—The purpose of this note is to direct attention to a hypothesis proposed by W. H. BENNETT in 1934. Consideration of this hypothesis, the authors suggest, should be incorporated into auroral stream theories. The hypothesis is based on calculations showing that "a stream of protons and electrons ejected from the sun in a wide angle cone will rapidly focus itself into a stream having a diameter of the same

order as the diameter of an auroral display." *Subject Headings:* **1. Corpuscular radiation 2. Solar proton theory 3. Auroral theories.**—*G.T.*

5C–235 551.594.51:551.501.42:621.396.11

Cain, Joseph C. (*Geophysical Institute of the Univ. of Alaska*), **Auroral radio-echo table and diagram for a station in geomagnetic latitude 56°.** *Journal of Geophysical Research*, Wash., D. C., 58(3):377–380, Sept. **1953.** fig., table, ref. **DWB**—CHAPMAN has computed the echo geometry of radio signals reflected from auroras for the transmitter-receiver sites at geomagnetic colatitudes, α 30°, 45° 60°, and 90°. This paper computes the echo geometry for $\alpha = 34°$, which is the geomagnetic colatitude of the Jodrell Bank Radio Experimental Station, of the University of Manchester, and is very close to that of the stations in northern United States which are concerned with radio echo work. *Subject Heading:* **1. Radio echoes from auroras.**—*Author's abstract.*

5C–236 551.594.51:551.594.6:538.56

Chapman, R. P. and Currie, B. W. (*Physics Dept., Saskatchewan Univ., Canada*), **Radio noise from aurora.** *Journal of Geophysical Research*, Wash., D. C., 58(3):363–367, Sept. **1953.** fig., 13 refs. **DWB**—A search for radio noise of 10-cm wavelength from aurora during 1951 and 1952 with improved equipment was unsuccessful. The failure to detect the auroral radio noise, observed previously in 1949, is attributed to the decrease of the intensity of auroral displays and of sunspot-activity. *Subject Heading:* **1. Radio echoes from auroras.**—*Authors' abstract.*

5C–237 551.501.81:551.594.5

Currie, B. W.; Forsyth, P. A. and Vawter, F. E. (*Physics Dept., Saskatchewan Univ., Canada*), **Radio reflections from aurora.** *Journal of Geophysical Research*, 59(2):179–200, June **1953.** 7 figs., 5 tables, 19 refs. **MH-BH**—This paper outlines observations and experiences associated with a continuing investigation of radio echoes from aurora at Saskatoon, Canada. For the three frequencies investigated—3000, 106, and 56 Mc/s—echoes have been observed with the last two. Echoes occur when the auroral forms exhibit some ray structure and, then, only from parts of the aurora at elevations less than 15° above the horizon. Using range-amplitude and range-azimuth displays of echoes in combination with the corresponding photographs of the aurora, it is shown that the echoes originate from levels close to the lower edge of the aurora. Height distributions of the centers from which the echoes come agree closely with height distributions found from parallactic photographs of aurora in other regions. Using aerial arrays for the 106- and 56-Mc/s frequencies that are mounted on a rotable tower so that each beam scans simultaneously the same part of the sky, the 106-Mc/s echoes are found to occur most frequently within the auroral zone and the 56-Mc/s echoes some distance to the south. Relative frequencies and diurnal variations of the two groups of echoes, as well as their heights and geographical distributions, indicate that echoes originate from a threshold process. It is suggested that the echoes arise by critical reflection from centers of high electron density (1.4×10^4 and 4×10^4 electrons per cm^3, respectively) that are formed close to but above the levels where the electron collision frequency exceeds the gyrofrequency of the electrons. *Subject Headings:* **1. Radio echoes from auroras 2. Saskatoon, Saskatchewan.**—*Authors' abstract.*

5C–238 551.594.51:551.521.64

Fan, C. Y. and Meinel, A. B., **Laboratory ionic impact emission spectra.** Chicago. Univ. Yerkes Observatory, Contract AF 19(122)-480, Technical Report, No. 1, April **1953.** 17 p. 3 figs., 5 tables, refs., eqs. **DWB.** Also: . . . Technical Report, No. 3, 1953. Reprint from: *The Astrophysical Journal*, Chicago, 118(2):205–213, Sept. **1953.** 3 figs., 5 tables, refs., eqs. **DWB**—A spectrographic study has been made of the optical emissions from a rarified air sample under the bombardment of protons (40–230 Kev), deuterons (75–320 Kev), H_0^+ ions (150–450 Kev), and N_0^+ ions (400 Kev). It was found that the ratio of intensity between the NII and N_2^+ emissions is approximately independent of the energies of the bombarding particles but very dependent upon the species of particle. As a consequence it is found possible to distinguish between protons and heavy ions by the spectrum produced, even when emissions from the exciting particles are absent. This discovery has made it possible to estimate the ratio of protons to heavy ions in the primary particle beam producing the aurora borealis. *Subject Headings:* **1. Auroral spectra 2. Corpuscular radiation 3. Experimental auroral spectra. I. Chicago. Univ. Yerkes Observatory, Williams Bay, Wisconsin II. Contract AF 19 (122)-480.**—*Authors' abstract.*

5C–239 551.5:016

†France. Centre National de la Recherche Scientifique, **Bulletin Analytique. Pt. 1, Mathématiques, physique, chemie, sciences de l'ingénieur.** [Analytical Bulletin. Pt. 1, Mathematics, physics, chemistry and engineering sciences.] Paris, Centre de Documentation du C.N.R.S. v. 1, publ. 1940; last issue recd., v. 14 (10), **1953.** Price: 5,000 fr. **MH-BH, DLC**—This voluminous

annotated bibliography contains in each issue a section on Physics of the Earth, of which Sec. IV. Oceanography, Sec. V. Hydrography, Sec. VI. Atmospheric Physics, Sec. VII. Meteorology, Sec. VIII. Upper Atmosphere, and Sec. IX. Terrestrial Magnetism, are of interest to meteorologists. In one issue these sections comprise about 14 pages and 200 entries. References to aurora will be found in the section on Upper Atmosphere. (*Same item as* 4.5–19, May 1953, *MAB.*) *Subject Headings:* **1. Periodicals 2. Bibliographies 3. Abstracts 4. Geophysics 5. French language.**—*M.R.*

5C–240 550.3(05)

Geophysiske Publikasjoner. Oslo, Norske Videnskaps-Akademi, v. 1, 1920; last issue recd., v. 19(1), **1953.** figs., tables, fold. charts, refs. (v. 18(8), 1952 latest at L.C.) **DLC, DWB**—A monographic series dealing with various phases of geophysics, particularly meteorology and terrestrial magnetism. Numerous articles by STÖRMER, RØSTAD, HARANG, TØNSBERG, VEGARD and KROGNESS reporting their extensive investigations of various phases of auroral phenomena have appeared in this publication. (*Same item as* 5A–218, Jan. 1954, *MAB.*) *Subject Headings:* **1. Geophysics 2. Auroras 3. Serial publications. I. Norske Videnskops-Akademie i Oslo II. Norway. Geofysiske Kommission.**—*M.L.R.*

5C–241 551.521.9

Goldstein, L.; Anderson, J. M. and Clark, G. L. (*Dept. of Electrical Eng., Univ. of Illinois, Urbana*), **Quenching of afterglow in gaseous discharge plasmas by low power microwaves.** *Physical Review*, N. Y., 90(3):486–487, May 1, **1953.** 2 figs., 4 refs. **DWB**—A brief report on the experimental results of a test of the Baily and Martin (1934) theory of the effect of interfering (cross modulation) waves on the temperature of a gaseous discharge plasma and hence on the collision frequency and intensity of the afterglow associated with recombination of the positive ions with electrons. He, Ne, A, Xe and a mixture of Ne and A were tested at 0.1 to 20 mm pressure, but only the results for Ne are described and illustrated in this note. . . . A decrease in photocurrent output was evident during application of the microwave pulse and the return to normal was slow after the sudden increase at the time of recombination. *Subject Headings:* **1. Neon afterglow 2. Ionospheric cross modulation 3. Recombination effects.**—*M.R.*

5C–242 551.594.51

Jones, A. Vallance; Hunten, D. M. and Shepherd, G. G. (*Dept. of Physics Univ. of Saskatchewan*), **Rotational temperatures of auroral N_2^+ bands.** *Astrophysical Journal*, 118(2):350–351, Sept. **1953.** fig., 4 refs. **DWB**—Microphotometer tracing of O–O N_2^+ band at 3914°A of aurora at 100–120 km is presented. Computed rotational temperature was 330°±40°K. *Subject Headings:* **1. Rotational temperatures 2. Auroral zone temperatures.**—*M.L.R.*

5C–243 551.594.5:550.38

Katz, Ludwig (*Air Force Cambridge Res. Center*), **Geomagnetism and the aurora.** *U. S. Air Research and Development Command, First Annual Science Symposium*, Eglin Air Force Base, Florida, May 18–20, 1953, p. 16–17, [**1953**]. **DWB**—The current theory regarding the relation between geomagnetism, the aurora, solar flares, the ionosphere, etc. based on new ideas of the coupling between electromagnetic and hydrodynamic forces in electrical conducting fluids, is reviewed descriptively. The 1% of the earth's geomagnetic field which is attributed to sources outside the earth's interior, is found to be sufficient to account for the violent magnetic disturbances associated with the aurora, and probably originates in ionospheric ionization by solar corpuscles acting in the magnetic fields of the sun and earth. Aim of the work at Cambridge Research Center on geomagnetism and the aurora is briefly described. *Subject Headings:* **1. Auroral magnetic relationships 2. Auroral theories.**—*M.R.*

5C–244 551.594.51:551.521.64:550.38

Landseer-Jones, B. C., **The streaming of charged particles through a magnetic field as a theory of the aurora.** *Journal of Atmospheric and Terrestrial Physics*, 3(1):41–57, Jan. **1953.** 6 refs., 30 eqs. **DWB**—The motion of a narrow stream of equal + and − particles, itself neutral, emanating from the sun and flowing into an increasing magnetic field, is discussed. With certain limitations it can be applied to the duration and height of auroras, but explanation of the auroral zones is difficult. (*Same item as* 4.8–281, April 1953, *MAB.*) *Subject Headings:* **1. Auroral theories 2. Corpuscular radiation 3. Terrestrial magnetism.**—*C.E.P.B.*

5C–245 551.594.5:551.510.535

Nagata, Takesi and Oguti, Takasi (*Geophys. Inst., Tokyo Univ.*), **Ionospheric storms in the auroral zone.** *Japan. Science Council, Ionosphere Research Committee, Report of Ionosphere in*

Japan, 7(1):21–28, **1953.** 6 figs., 14 refs., 12 eqs. **DWB**—Characteristics of the daily and monthly variations of abnormal changes of *fo*F2 associated with magnetic storms at College, Alaska are statistically examined. The results are as follows: (i) *fo*F2 decreases due to magnetic storms so far as F^2-layer in the auroral zone is situated in the sunlit region, while it increases in dark hours. (ii) The said change of *fo*F2 begins usually just after the commencement of magnetic storm, and reaches the state of saturated activity a few hours later. (iii) Theoretically, the *fo*F2 depression in the sunlit times may be attributed to the expansion of F^2-layer due to heating caused by impinging corpuscles. *Subject Headings:* **1. Auroral zone disturbances 2. Ionospheric storms.**—*Authors' abstract.*

5C–246 551.594.51

Oliver, N. J.; Wolnik, S. J.; Scanlon, J. C. and Chamberlain, J. W. (*Geoph. Res. Directorate; Air Force Res. Center; Air Res. & Develop. Command, Cambridge, Mass.*), **Some remarks on spectra of low-intensity auroras.** *Optical Society of America, Journal*, 43(8):710, Aug. **1953.** refs. **DWB**—Based on observations made at Point Barrow during the winter of 1952–53 with a grating spectrograph with a quartz flat-field Schmidt camera in the first, second and third orders for the infrared, visible and UV regions, respectively. Summarizes results obtained in measuring nearly 150 lines and bands with wave lengths between 3150 and 8850 Å. NaD lines were quite strong, several airglow OH bands were recorded in the infrared, identification of numerous N_2 first positive bands with $v \leq 11$ seem quite certain, most of the permitted lines of NI, NII, OI and OII are quite faint. *Subject Headings:* **1. Auroral spectra 2. Auroral intensities 3. Point Barrow, Alaska.**—*M.L.R.*

5C–247 551.594.51

†*Petrie, W. (*Defence Research Board, Ottawa*) and Small, R. (*Dominion Obs., Ottawa*), **The intensities of atomic and molecular features in the auroral spectrum.** *Canadian Journal of Physics*, 31(6):911–926, Sept. **1953.** 4 figs., 13 tables, 22 refs., 4 eqs. **DWB**—A considerable number of auroral spectrograms (dispersion 85–28 Å/mm.) have been analyzed with a recording microphotometer, and integrated intensities obtained for the main features. Relative population rates of the relevant levels are determined from the measured intensities. Excitation mechanisms are discussed and the absence from the spectra of certain low level atomic lines does not appear to be anomalous. It seems that atomic lines are emitted as the results of several processes, while the ionic lines are produced during simultaneous ionization and excitation through electron exchange. Vibrational temperatures of First Negative, First Positive, and Second Positive nitrogen bands are computed. *Subject Headings:* **1. Auroral spectral intensity 2. Auroral nitrogen bands 3. Upper air temperatures.**—*Authors' abstract.*

5C–248 551.521.4:06

Roach, Franklin E., **The Liège conference on the optical study of the earth's atmosphere.** *Optical Society of America, Journal*, 43(7):624–625, July **1953.** **DWB**—Recent advances reported to a symposium on Sept. 3 and 4, 1951 are summed up. Especially mentioned are the discovery of several members of the Balmer series of hydrogen in some polar auroras, theories on nightglow, study of the twilight appearance of sodium D, and laboratory techniques developed for reproducing auroral and nightglow emission and for measuring the absolute absorption coefficients of N_2 and O_2 in the vacuum ultraviolet. For a complete list of the 31 papers reference is made to an earlier report in *O.S.A.J.* 43(1):67, Jan. 1953. Abstracts of several of these papers have been included in this bibliography. *Subject Headings:* **1. Atmospheric optics 2. Conferences.**—*G.T.*

5C–249 551.594.51:551.521.3

Vassy, Arlette T. (*Univ. of Paris, Science Faculty*), **Remarks on the role of absorption in the spectrum of polar aurora and of the night sky.** London, Ontario. Univ. of Western Ontario, Dept. of Physics, Contract AF 19(122)-470, Scientific Report, No. 9, June 20, **1953.** 8 p. 11 refs. **DWB**—A free translation from French into English of remarks by Mme. Vassy as consultant to AFERC under contract during Auroral Physics Conference at Univ. of Western Ontario, July 1951. Emphasis is placed on a careful study of absorption characteristics of night airglow and diurnal emissions passing through the atmosphere, especially when coming from low angles. Zenith measurements are more accurate, but seasonal effects can even be found in absorption due to water vapor changes, thus affecting intensities recorded. Accurate records of intensities of bands as well as positions are necessary owing to lack of dispersive power of spectrometers used for auroral and night sky measurements (the former are more dispersive and intense than the latter). Determination of intensity of emission would permit verification of statistical distribution of certain groups and levels so as to prove or disprove the current hypothesis of a state of radiative equilibrium. *Subject Headings:* **1. Auroral spectroscopy 2. Auroral line absorption 3. Night airglow absorption 4. Atmospheric absorption. I. Hunten, Janet** (*trans.*) **II. London, Ontario. Univ. of Western Ontario. Dept. of Physics III. Contract AF 19(122)-470.**—*M.R.*

1954

5C–250 550.3(02)

†**American Geophysical Union, Transactions.** Washington, D. C., National Research Council of the National Academy of Sciences, v. 1, 1920; latest issue received, v. 35(1), Jan. **1954. DLC**—This publication contains original papers and bibliographies in all of the branches of geophysics: meteorology, hydrology, oceanography, seismology, vulcanology, geodesy, terrestrial magnetism, atmospheric electricity and tectonophysics. (For fuller abstract *see* 1–2, Jan. 1950, *MAB.*) *Subject Headings:* **1. Geophysics 2. Auroral bibliographies.**—*M.L.R.*

5C–251 551.594.51

Branscomb, L. M.; Shalek, R. J. and Bonner, T. W., **Intensity distribution in nitrogen bands excited in auroras and by high-energy protons and hydrogen atoms.** *American Geophysical Union, Transactions,* 35(1):107–113, Feb. **1954.** 6 figs., refs. p. 113. **MH-BH**—Nitrogen negative and second negative band spectra have been excited by 100-kv protons and hydrogen atoms from the Rice Institute van de Graaff accelerator. The intensity distributions in the vibrational bands are compared with spectra produced in controlled laboratory experiments by canal rays and electron impact with auroral spectra, and with results of theoretical calculations. Excitation of second positive bands by high-energy neutral hydrogen atoms and of the negative bands by both neutral hydrogen and protons show the expected marked increase in the rate of population of high vibrational states. Theories for the excitation of the auroral bands are discussed in the light of these results and of theoretical considerations. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands 3. Experimental auroral spectra.**—*Authors' abstract.*

5C–252 551.594.5 550.38

Hulburt, Edward O., **Magnetic storms, aurorae, ionosphere and zodiacal light.** *Scientific Monthly,* 78(2):100–109, Feb. **1954.** 7 figs., photo, 31 refs. **DWB**—The following topics are considered: 1) magnetic storms, particularly the characteristics of those with sudden commencements; 2) the ultraviolet light theory of magnetic storms and auroras which attempts a unified explanation of these phenomena as well as ionospheric storms, zodiacal light and Gegenschein; 3) the solar corpuscular theory with brief mention of STÖRMER, CHAPMAN and FERRARO, MARTYN, and ALFVÉN; 4) the experiments of MEINEL and GARTLEIN on the aurora; 5) BENNET and HULBURT's theory (*see* 5C–234 above) to explain how high-speed protons may be deflected to auroral zones and 6) zodiacal light and Gegenschein. In conclusion, the author states that there are 2 effects that should always be kept in mind when thinking about the outer fringe of the earth's atmosphere: "the sweep-up by the earth of interplanetary material and the electric charge brought to the earth by cosmic rays." Schematic diagrams illustrate several of the theories reviewed. *Subject Headings:* **1. Auroral theories 2. Magnetic storms.**—*M.L.R.*

5C–253 551.594.51

Omholt, A., **The intensity distribution in the second positive band system of nitrogen in a laboratory light source and in the aurorae.** *Journal of Atmospheric and Terrestrial Physics,* 5(1):63–66, March **1954.** 4 tables, 7 refs., 3 eqs. **MH-BH**—The intensity distribution in the second positive band system of N_2 emitted from a Hilger discharge lamp was measured and agrees with theoretical values. Auroral intensities at Tromsö (Vegard) are examined and the most probable values of the population of the positive system of nitrogen are calculated. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands.**—*C.E.P.B.*

5C–254 55 551.594.5(05)

†**Physics Abstracts (Section A of Science Abstracts).** Edited and issued by the Institution of Electrical Engineers in association with The Physical Society, The American Physical Society and The American Institute of Electrical Engineers. London. v. 1, 1898; latest issue received v. 57, No. 2, Feb. **1954.** Title varies. **DLC**—Abstracts of material in the physical sciences included in Science Abstracts v. 1–5, 1898–1902; with v. 6–1903 to date Science Abstracts has come out in two sections, A—Physics Abstracts and B—Electrical Engineering Abstracts, and each continues the numbering of the parent publication. Physics Abstracts presents a world wide coverage of literature in all phases of physical science. The abstracts are arranged according to the Universal Decimal Classification system. The section on Geophysics (55) contains material on auroras classified as 551.594.5, 551.594.51, 551.594.52 and 551.594.53. Each number contains an author index; the annual index contains an alphabetical list of authors with shortened titles, a detailed subject index and a collected list of subject headings. *Subject Headings:* **1. Physical sciences 2. Geophysics 3. Auroral physics 4. Abstracting periodicals.**—*M.L.R.*

SUPPLEMENTARY MATERIAL

5C–255 551.594.5:016

†Hellman, Gustav, **Repertorium der deutschen Meteorologie.** [A reportory of German meteorology.] Leipzig, Wilhelm Engelmann, **1883.** 995 p. chart, table. **DLC**—Approximately 20 references to works of German authors on Aurora and Auroral theories are listed on p. 687–688, 690. *Subject Headings:* **1. Auroral theories 2. Bibliographies.**—*M.L.R.*

5C–256 551.594.5

Prishletsov, V. I., **Poliarnoe siianie.** [Aurora.] (In his: **Geofizika.** Moscow, **1946.** p. 244–247. figs., eqs.) **DLC**—This section contains a brief discussion of the height of the aurora (Störmer), of its spectral characteristics and of Störmer's and Birkeland's hypotheses as to its origin. The hypothesis that the individual streams of particles do not influence each other is based upon the assumption that the sole fact acting upon the particles is the magnetic field of the earth. The movement of the negative particles in the earth's magnetic field is analyzed mathematically. *Subject Headings:* **1. Auroral theories 2. Auroral spectra.**—*I.L.D.*

5C–257 551.521.4 551.594.5

Barbier, Daniel and Pettit, Helen, **Photometric observations of the airglow and of the aurora borealis at College, Alaska.** *Annales de Géophysique,* 8(2):232–247, April/June **1952.** 7 figs., 6 tables, 12 refs., eqs. French and English summaries p. 232. **DWB**—Observations made at College, Alaska, in Feb. 1949 with a photometer designed by F. E. Roach are discussed with special attention to the corrections for scattered light. The results are as follows. Airglow: The intensity of the green line is about the same as is found in regions of moderate latitude while the D line and λ 5210 are much weaker. Aurora borealis: Most of the observations of the green line indicate a height of 135 km, but a few give 750 km. The other two radiations seem to be emitted at high altitudes. Some indication of the macroscopic structure of the observed aurorae is given. *Subject Headings:* **1. Night airglow 2. Auroras 3. College, Alaska.**—*Authors' abstract.*

5C–258 551.594.51

†*Chamberlain, Joseph W. and Oliver, Norman J., **Atomic and molecular transitions in auroral spectra.** *Journal of Geophysical Research,* 58(4):457–471, Dec. **1953.** 5 figs., 3 tables, 25 refs. **DLC**—The identifications of lines and bands in auroral spectra, as reported by several observers over the past few years, are subjected to a critical analysis in order to determine which atomic transition arrays and molecular progressions are most important. The various transitions are analyzed from the standpoint of expected relative intensities of lines or bands originating from common upper levels, and the probable validity of the identifications is discussed. Tables are presented listing the emissions that seem to be well established in at least some auroral displays. Variations in auroral spectra with latitude, type of display, etc., undoubtedly account for many of the discrepancies among the wavelength lists of different authors. Hence it is not always possible to differentiate between real and fortuitous identifications. A large number of fainter lines and bands still remain unidentified. *Subject Heading:* **1. Auroral spectra.**—*Authors' abstract.*

5C–259 551.510.41:551.594.51

Dufay, Jean, **Les raies interdites de la haute atmosphère, des nébuleuses et de la couronne solaire.** [The forbidden bands of the upper atmosphere, of nebulas and of the solar corona.] *L'Astronomie,* Paris, May **1953.** p. 169–174. 2 figs. **DWB**—A general but technical discussion of present knowledge of forbidden rays of oxygen, nitrogen, etc. in the upper atmosphere (auroral spectra), in gaseous nebulas and in the solar corona (Fe, Ni, A, and O). The various states of these gases are distinguished. *Subject Headings:* **1. Forbidden rays 2. Auroral spectra.**—*M.R.*

5C–260 551.594.51:550.38:551.510.535

Meek, J. H., **Correlation of magnetic, auroral and ionospheric variations at Saskatoon.** *Journal of Geophysical Research,* 58(4):445–456, Dec. **1953.** 7 figs., 6 refs. **DLC**—An analysis has been made for the five-month period from December 1951 to April 1952 of the variations at Saskatoon of the horizontal component (H) of the earth's magnetic field, the position in the sky and intensity of auroral light, and of critical frequencies and heights of the ionospheric reflecting regions. There is a relationship between the maximum elevation above and the northern horizon of auroral light and the maximum amplitude of variation of H. Some types of sporadic E reflecting layers appear more frequently during disturbances. Detailed analysis of magnetically disturbed nights shows that magnetic bays and certain other phenomena are correlated. An increase in the intensity of aurora is related to the rate of decrease of H in the bay. Radio wave absorption or weak reflections at levels below 100 km correspond to the periods when H is of the order of 500 gammas or more from its

normal value. *Subject Headings:* **1. Auroral intensity variations 2. Magnetic variations 3. Ionospheric variations.**—*Author's abstract.*

5C–261 525.75:551.51 551.521.4

Pastiels, R., **Les émissions lumineuses du ciel nocturne.** [Luminous emissions of the night sky.] *Ciel et Terre*, Uccle, 69(11/12):289–296, Nov./Dec. **1953.** 2 figs., table. **DWB**—Review of recent work on night airglow, twilight glow, and the aurora, especially with the spectra of these luminous phenomena and their interpretation. Various lines and bands are identified. *Subject Headings:* **1. Night airglow spectrum 2. Auroral spectra 3. Twilight luminescences.**—*M.R.*

5C–262 551.594.5:551.521.4:551.557

Wulf, Oliver R., **On the production of glow discharges in the ionosphere by winds.** *Journal of Geophysical Research*, 58(4):531–538, Dec. **1953.** 2 figs., 15 refs. **DLC**—It is suggested that a source is to be found in potential differences generated by zonal ionospheric winds cutting the earth's magnetic field. A return path of current flow (glow discharge) in the higher ionosphere appears plausible. The principal effect in this process arises from the cutting of the vertical component of the field by broad horizontal winds. An auroral zone results as the region where the product of wind velocity and vertical field intensity has a maximum. From this point of view, the aurora and the airglow (at least a portion of it) are manifestations of the same thing. The aurora occurs under high excitation when the winds are strong in high latitudes, while this portion of the airglow is always present in some measure in most latitudes, arising from lower velocity winds. Patterns in the large-scale air circulation should lead to patterns in the intensity of the emission, and the regular diurnal disturbance of these upper atmosphere zonal winds should lead to diurnal features in the aurora and airglow. *Subject Headings:* **1. Aurora-wind relationships 2. Night airglow 3. Ionospheric winds.**—*Author's abstract.*

5C–263 551.594.5:551.510.535

Heppner, James P., **Association of absorption and sporadic E ionization with aurora at high latitudes.** *Alaskan Science Conference, 2nd, Mt. McKinley National Park, Sept. 4–8, 1951, Proceedings*, p. 278–279, [publ. **1953?**] **DWB**—Analysis of vertical incidence measurements of nocturnal E ionization and absorption shows that: 1) when aurora is *not* present in evening, high frequency traces show F layer but no E layer. When aurora is present E layer is always present. 2) E_s ionization increases at successively greater heights as auroral arc approaches zenith from N. 3) Changes in height of maximum electron density parallel changes in auroral height. 4) Erratic radio transmission may be due to scattered reflection from non-pulsating auroras, whereas absorption is more nearly related to pulsatory auroras. 5) Conditions associated with pulsatory auroras resemble those during magnetic bays. Correlations may differ with changes in geomagnetic latitude near auroral zone. *Subject Headings:* **1. Auroral-ionospheric relationships 2. Sporadic E layer (E_s) height changes.**—*M.R.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

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Annales de Géophysique, Paris, Volume 9, Number 4, October/December 1953

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Baillet, A.; Barbier, D.; Bosson, F.; Lallemand, A. and Maguery, J.: **Description d'un photomètre automatique pour l'étude de la lumière du ciel nocturne,** [Description of an automatic photometer for the study of the light of the night sky], p. 309–316.

Delobeau, Francis: **L'éclipse de soleil du 25–2–1952 à Gao,** [Solar eclipse of Feb. 25, 1952 at Gao], p. 317–324.

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Jobert, N.: **Dispersion des ondes de surface dans la couche superficielle du glacier du Groenland,** [Dispersion of surface waves in the surface layer of the Greenland glacier], p. 345–357.

Crenn, Y.: **Anomalies gravimétriques et magnétiques liées aux roches basiques de Nouvelle-Calèdonie,** [Gravimetric and magnetic anomalies related to basic rocks of New Caledonia], p. 291–299.

Climatic change: evidence, causes, and effects. Shapley, Harlow (*ed.*) Cambridge, Mass., Harvard Univ. Press, 1953.

Shapley, Harlow: **On climate and life,** p. 1–12.

Coon, Carleton S.: **Climate and race,** p. 13–34.

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Journal of Meteorology, Volume 11, Number 1, February 1954

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Number 34, March 1953.

Hirano, T.: **Horizontal mixing and flow in a boundary area of the Kuroshio off Nojima-Zaki,** p. 105–112.

Société Royale des Sciences de Liège, Mémoires, 4th Ser., Volume 12, Number 1/2, 1952.

Roach, F. E. and Pettit, Helen B.: **Excitation patterns in the nightglow,** p. 13–42.
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Bricard, J. and Kastler, A.: **Sur l'altitude de la couche luminescente de sodium dans la haute atmosphère. Critique de la méthode zénith-horizon,** [Altitude of the luminescent sodium layer in the upper atmosphere. Critique of the zenith-horizon method], p. 87–96.

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Zeitschrift für Meteorologie, Volume 7, Number 12, December 1953.

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PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

Académie des Sciences, Paris, Comptes Rendus.
Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.**, [Moscow].
American Geophysical Union, Transactions, National Research Council, Washington.
★**American Meteorological Society, Bulletin,** [Boston].
★**Angewandte Meteorologie,** [Potsdam].
Annales de Géophysique, Centre National de la Recherche Scientifique, [Paris].
★**Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A** and **Ser. B,** [Vienna].
Australian Journal of Physics, [Melbourne].
Ciel et Terre, Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels].
★**Geofisica e Meteorologia,** Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisca Italiano, [Milan].
Geophysical Magazine, [Central Meteorological Observatory, Tokyo].
★**Idöjárás,** Az Országos Meteorológiai és Földmágnességi Intézet [Budapest].
★**Indian Journal of Meteorology and Geophysics,** [Delhi].
★**Journal of Atmospheric and Terrestrial Physics,** [London].
Journal of Geophysical Research, [Washington].
★**Journal of Meteorological Research,** [Tokyo].
★**Journal of Meteorology,** American Meteorological Society, [Boston].
★**Journal Scientifique de la Météorologie,** Société Météorologique de France, [Paris].
★**The Marine Observer,** Air Ministry, Meteorological Office, London.
★**The Meteorological Magazine,** Air Ministry, Meteorological Office, London.
★**Meteorological Society of Japan, Journal,** Second Series, Kisho Shushi, [Tokyo].
★**La Météorologie,** Société Météorologique de France, [Paris].
★**Meteorologische Rundschau,** [Bad-Kissingen].
★**Meteoros,** [Buenos Aires].
★**Monthly Weather Review,** U. S. Weather Bureau, Washington, D. C.
Nature, [London].
Polarforschung, Archiv für Polarforschung in Kiel, [Kiel, Germany].
Revista de Geofísica, Instituto Nacional de Geofísica, [Madrid].
★**Revista Meteorologica,** Junta Nacional de Meteorología, Montevideo.
★**Rivista di Meteorologia Aeronautica,** Associazione Culturale Aeronautica, [Rome].
★**Royal Meteorological Society, Quarterly Journal,** [London].
Royal Society of London, Proceedings, Ser. B.
★**Tellus,** Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Moscow-Leningrad].
★**Weather,** Royal Meteorological Society, [London].
★**Weatherwise,** Amateur Weathermen of America, Philadelphia.
★**Wetter und Leben,** Österreichische Gesellschaft für Meteorologie, [Vienna].
★**WMO Bulletin,** World Meteorological Organization, [Geneva].
★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam.

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